FOUNDRY TRADE JOURNAL

EST. 1902

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MARCH 9, 1961
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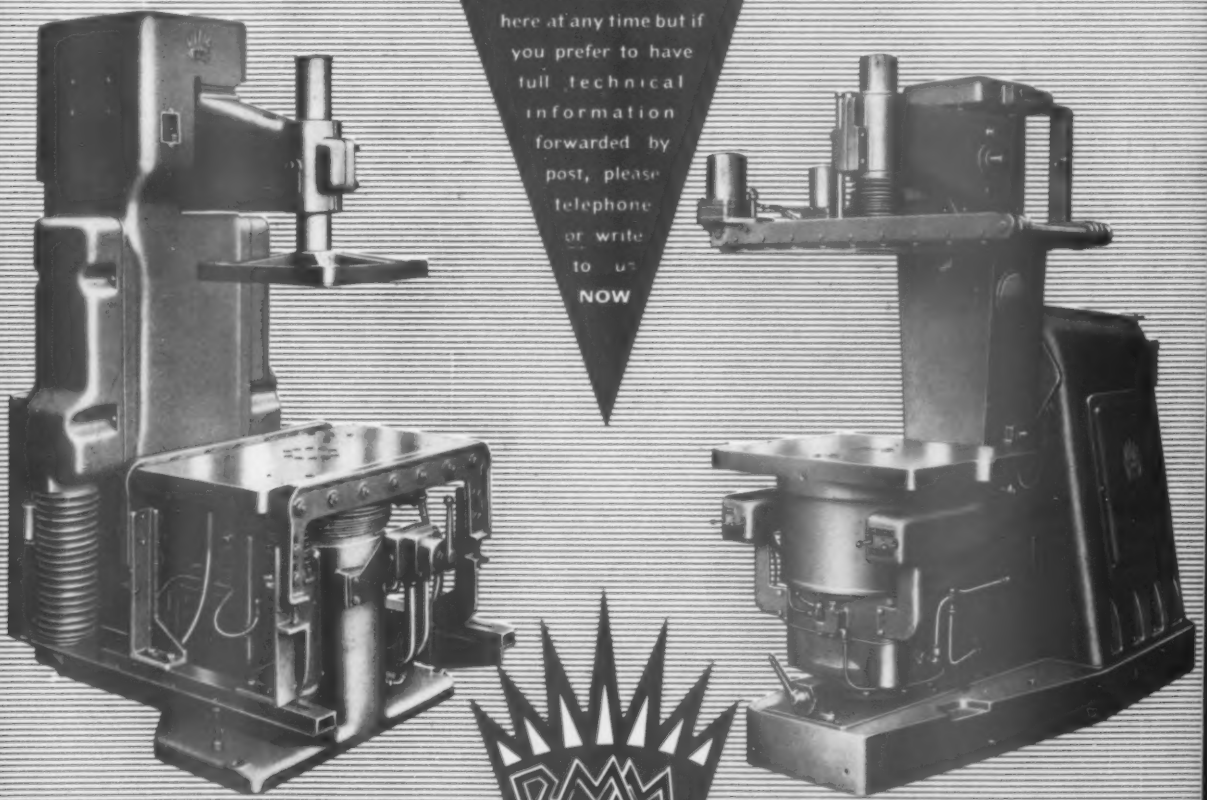

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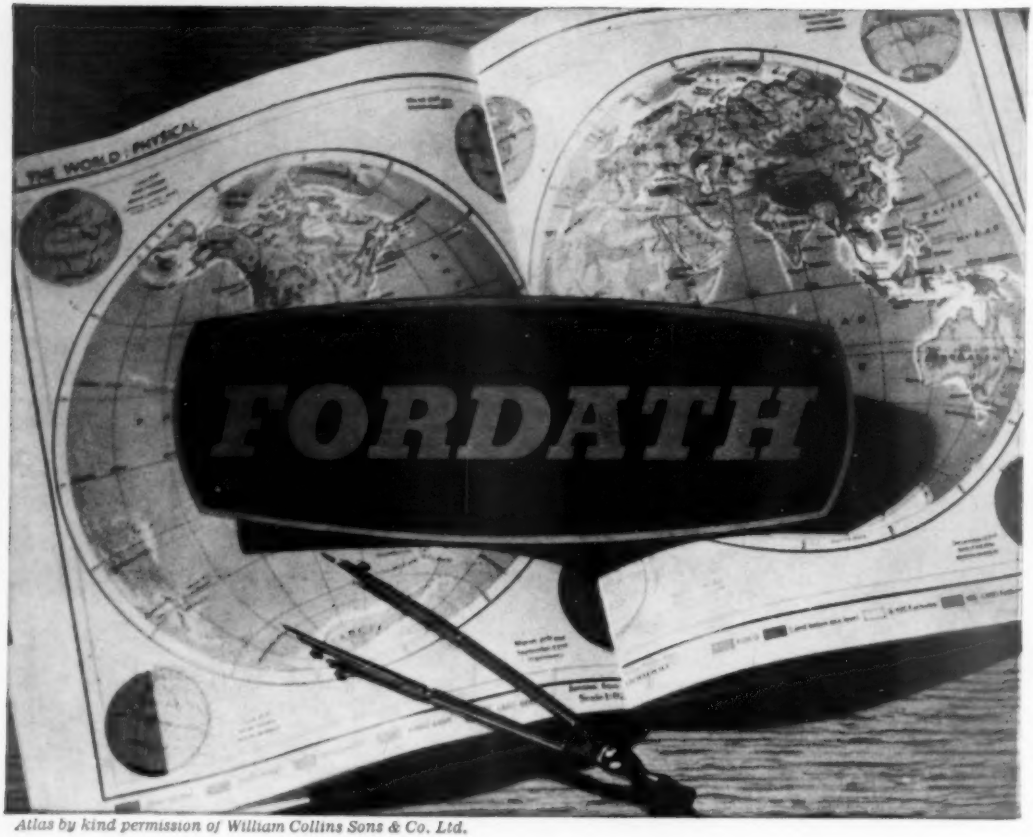

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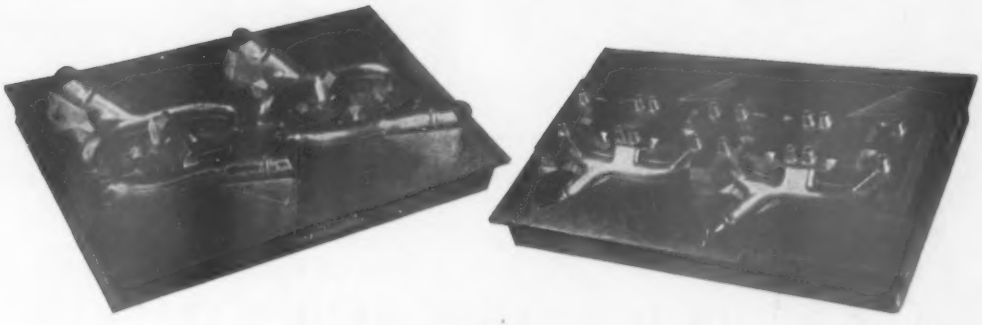

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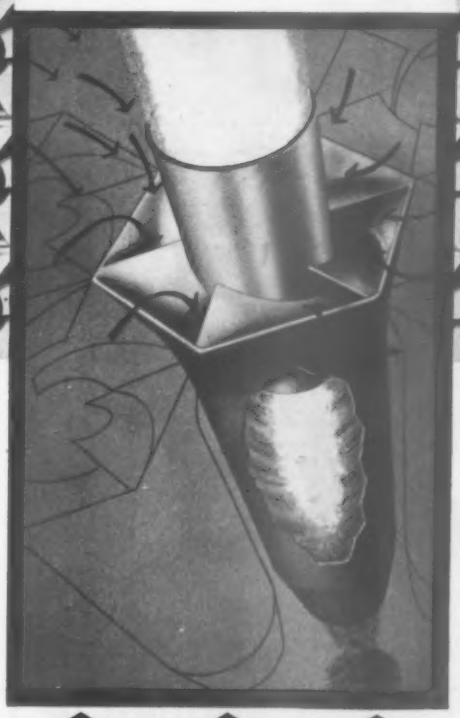

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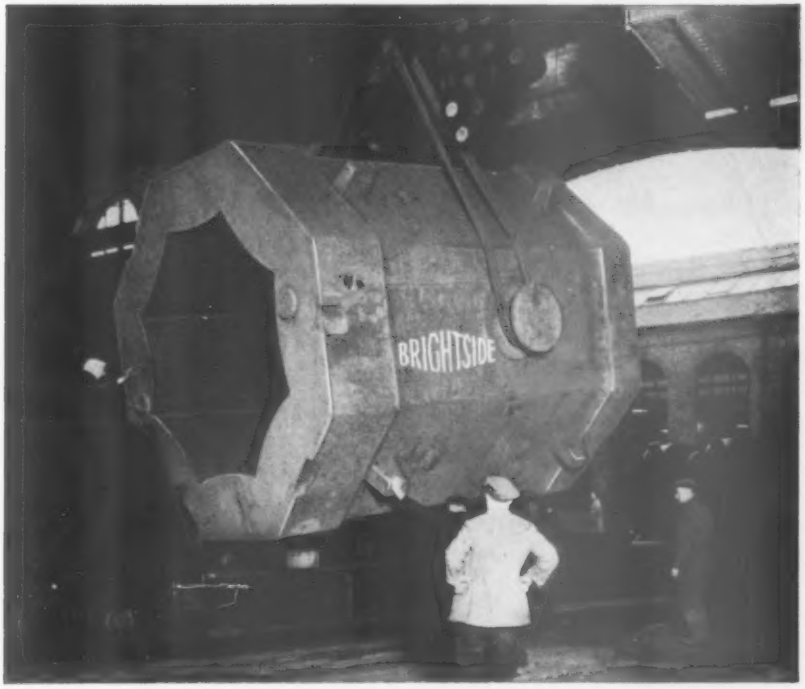

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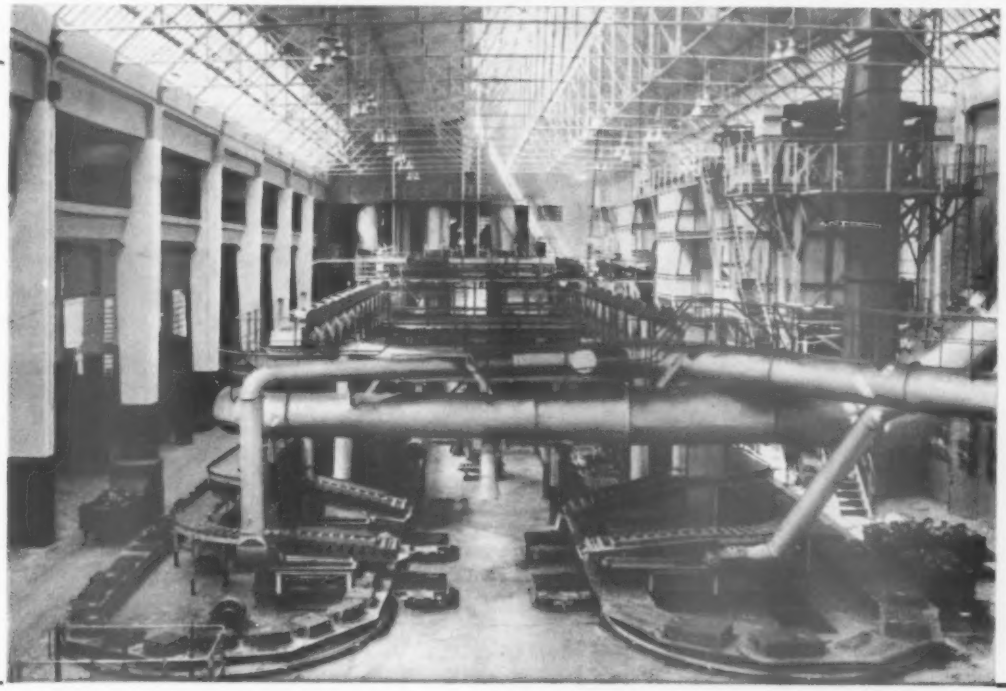

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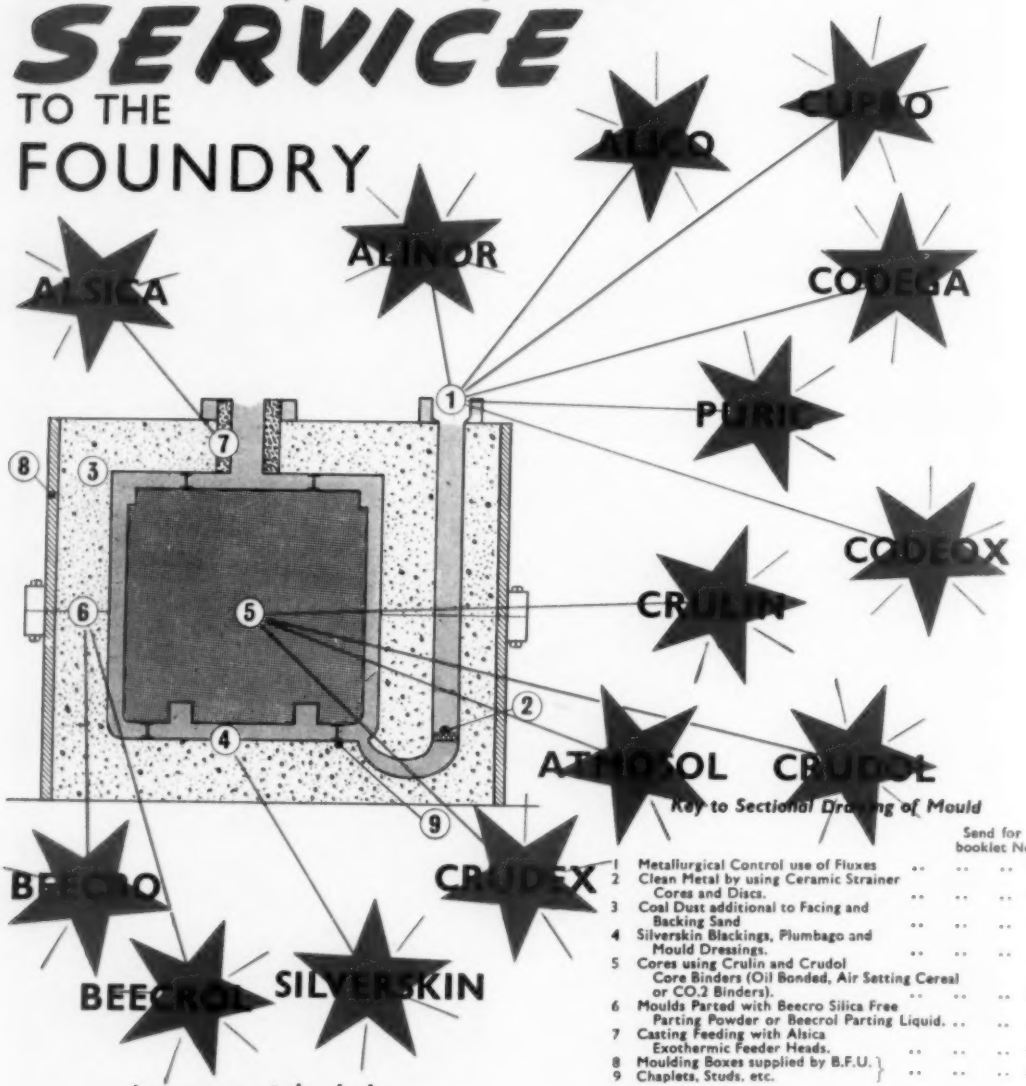

Key to Sectional Drawing of Mould

		Send for booklet No.
1	Metallurgical Control use of Fluxes	3
2	Clean Metal by using Ceramic Strainer Cores and Discs.	4
3	Coal Dust additional to Facing and Backing Sand	1
4	Silverskin Blackings, Plumbago and Mould Dressings.	1
5	Cores using Crulin and Crudol Core Binders (Oil Bonded, Air Setting Cereal or CO.2 Binders).	2
6	Moulds Parted with Beecro Silica Free Parting Powder or Beecrol Parting Liquid.	1
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8	Moulding Boxes supplied by B.F.U.	5
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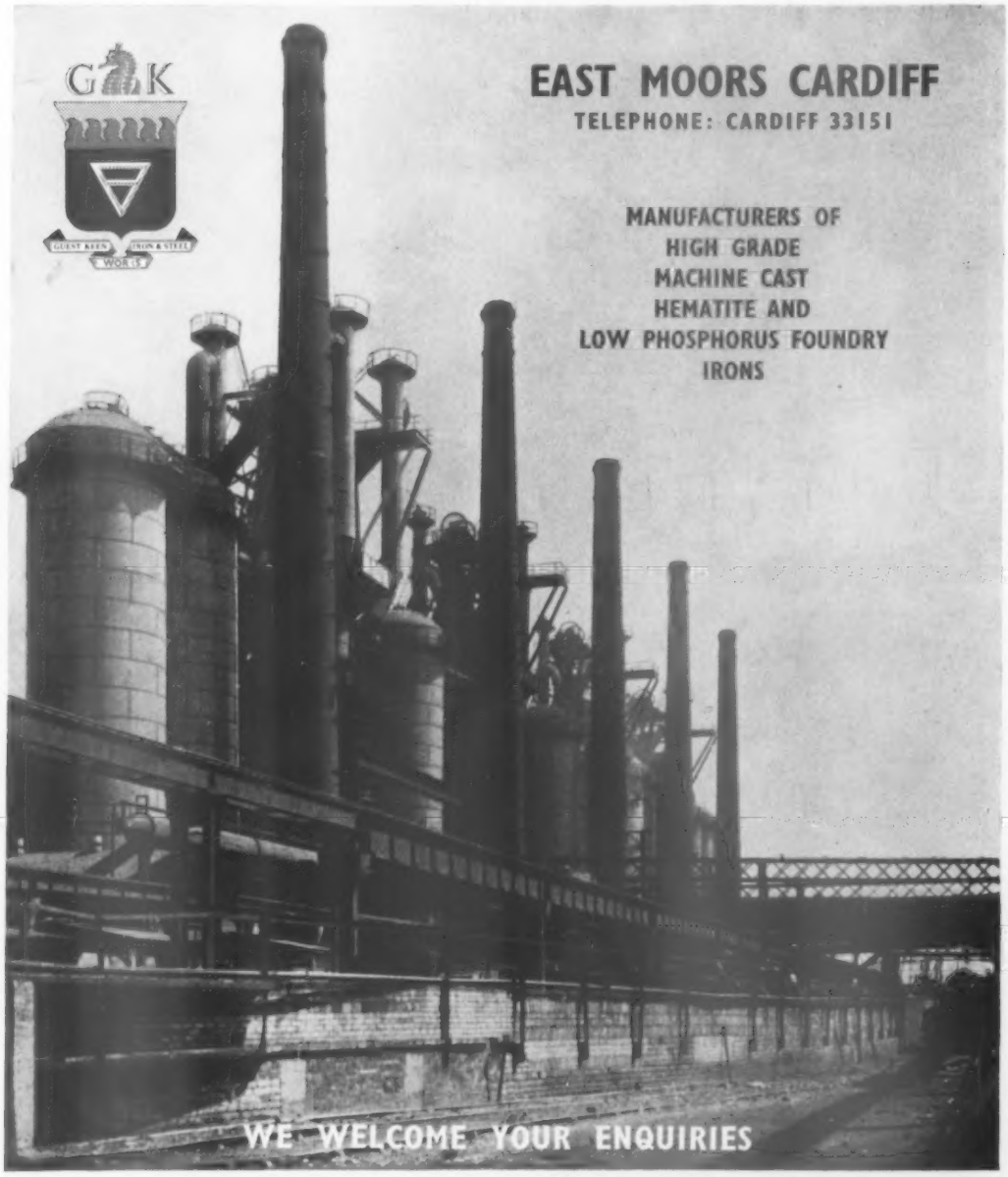

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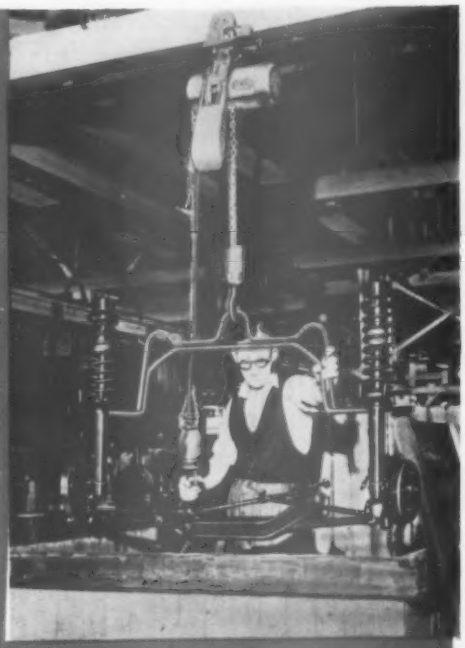

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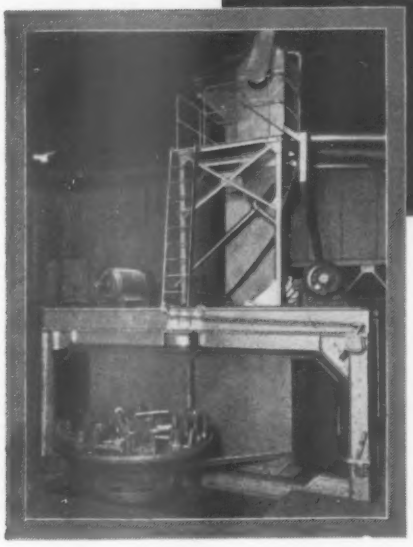

The plant illustrated is a 6ft. Dual Swing Table Wheelabrator installed at Messrs. Jarrow Metal Industries Ltd. It is engaged in cleaning a miscellaneous load of steel castings and the cleaning cycle is eight minutes. This type of plant enables one table to be unloaded and reloaded whilst the other table is under the blast stream and each table is capable of carrying two tons.

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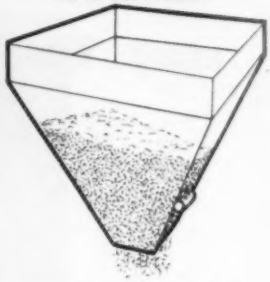
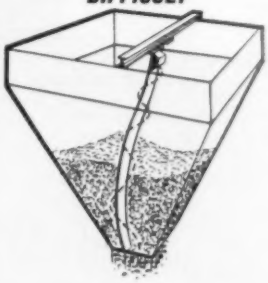


External vibrator on steel hopper.

DIFFICULT



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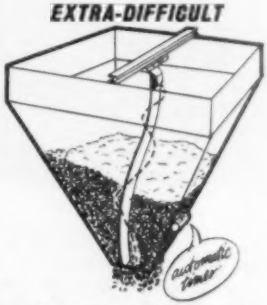

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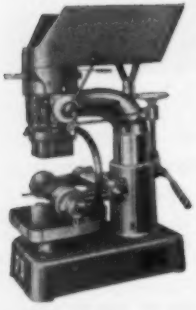

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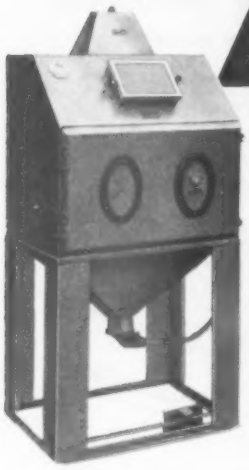

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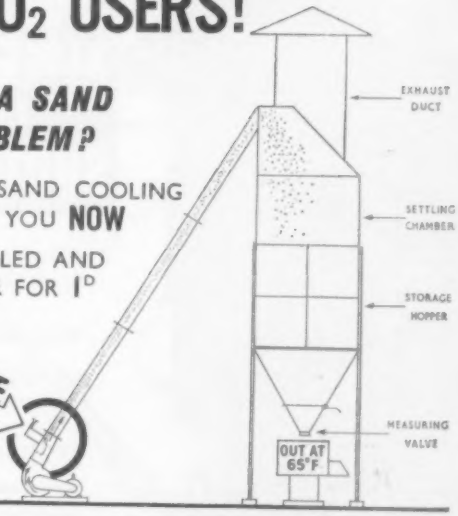

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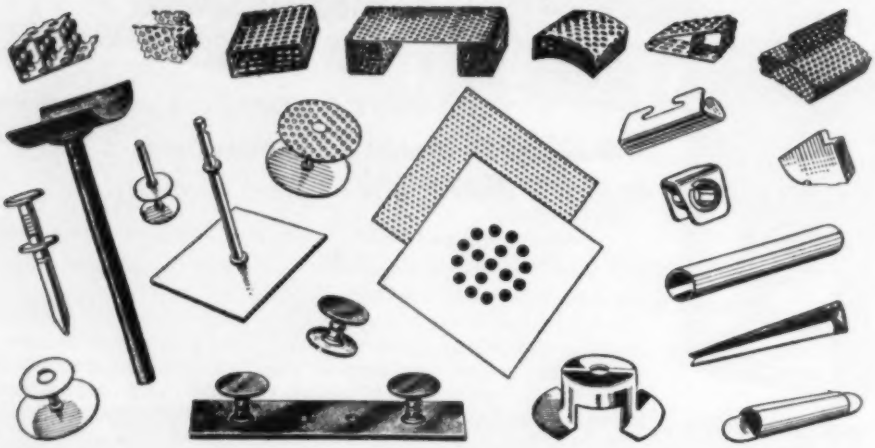

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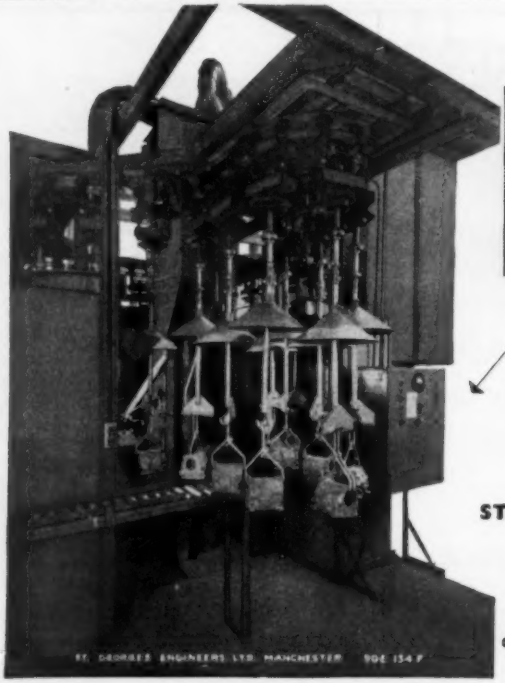

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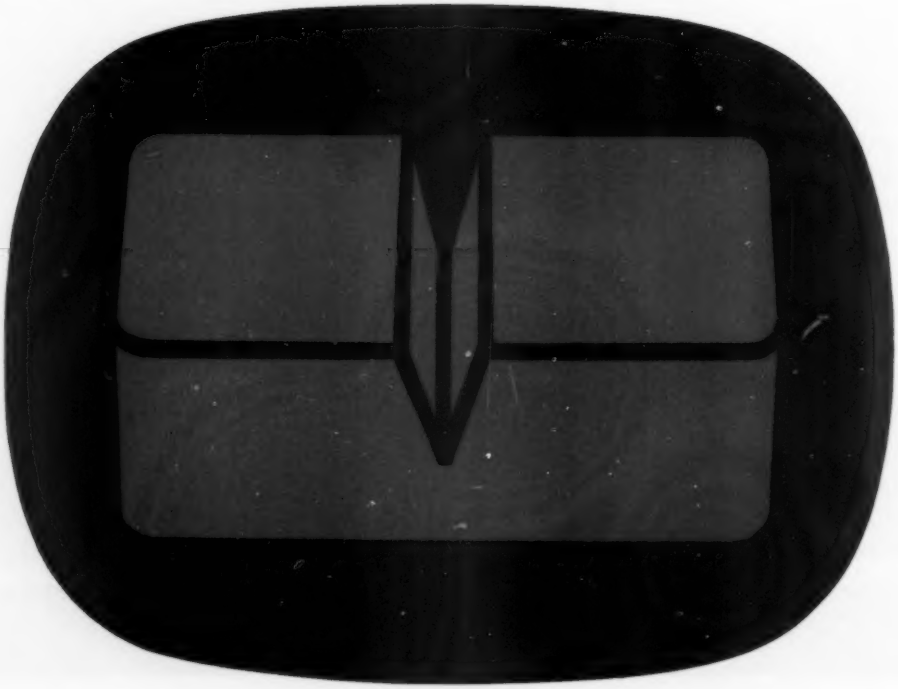

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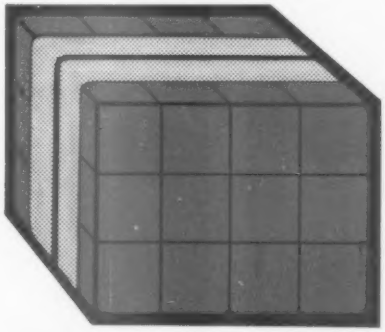

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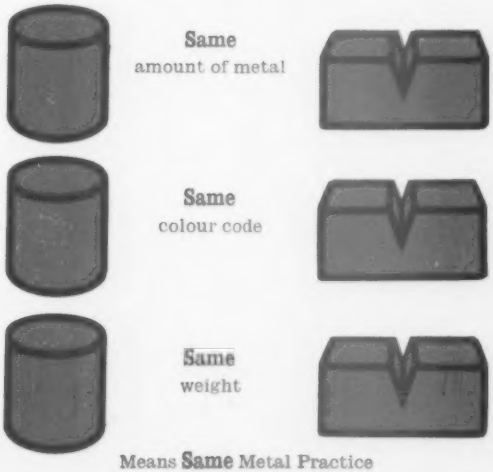

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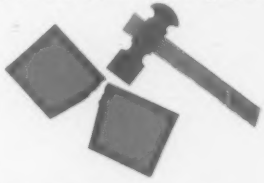

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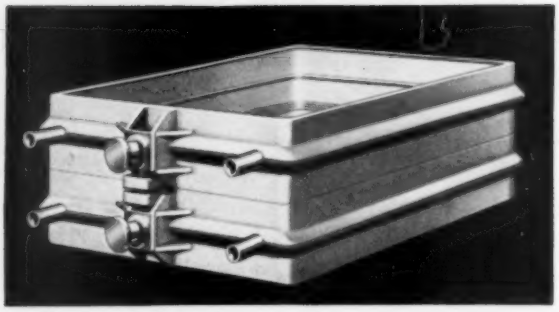

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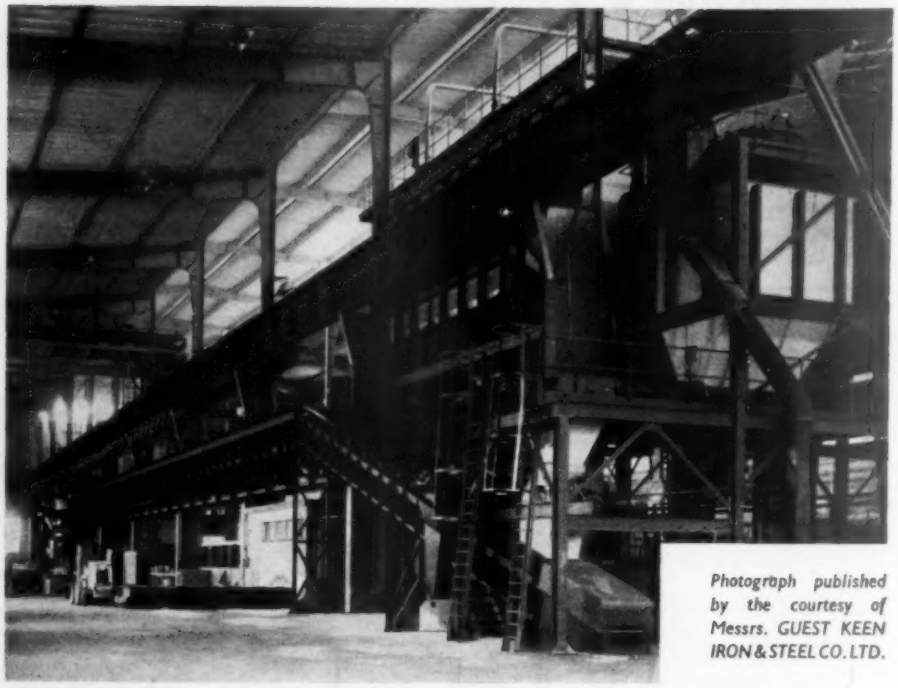

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Vol. 110 March 9, 1961 No. 2309

Output of Castings in 1960

It is pleasing to announce that the United Kingdom production of iron castings reached record figures last year. Surveying statistics for past years, no figures were available before 1940 when about 2¾ million tons were made; then the output declined until 1945 when just under 2 million tons were produced. From then on, a steady increase was shown year by year until 1955 when the total reported was 3,925,070 tons. Thereafter, the output receded again, reaching the low figure of 3,465,590 tons in 1958. The following year's figures were little better, but 1960, at 3,967,570 tons, has proved to be an all-time record. In recent years, it is interesting to note the growing contribution to the total production which has been made by the North Western region. When assessing the achievement countrywise it should be borne in mind that output tonnage figures are not necessarily directly related to value, for those castings which boost the figure are often of the low-priced variety.

The country's steelfounders last year produced 298,900 tons—100 tons lower than our forecast. Since statistics first became available in 1940, steel castings output has varied between 365,100 tons in 1943 to 198,000 tons in 1945. However, discounting "wartime" figures as an unreliable index, last year's figures are the best since 1957. The steelfoundry industry has changed radically since the outbreak of the last war, when so much of the output was immediately taken up with the supply of armaments. The slowing-down of the mechanization of the coalmining industry also has had its influence felt in steelfounding circles. Nowadays, steelfounders are making much more complicated castings for a wider variety of industries.

Copper-base alloy foundries have had a good year and one has to return to 1944 to find a greater output in this country, for last year it attained 88,977 tons. Again looking back, it is clear that the figures for 1942 to 1944—ranging between 125,000 to 143,500 tons—were possibly based on a different set of statistics or the influence of the war supply position must have been profound. Brass and bronze founders have been much perturbed at the loss of business to other industries and it would be interesting to learn whether these competitive trades enjoyed more than the 5·4 per cent increase shown by the brassfounders. The light-alloy foundry industry figures have not yet been received from the Ministry of Aviation, but we are confident that they will attain a 100,000 tons output, which again will be an all-time record. Since the 1941 production of 31,600 tons (the earliest record available to us), production on this side of the UK foundry industry has been trebled. The change in the type of output during that period has been noteworthy. Production of sand castings has gradually lost ground to die-castings and now it is the pressure-die-casting type which is making most headway.

The foundry industry as a whole can be proud of last year's achievements, but, as always, the increase is by no means evenly spread, variation being caused by the degrees of activity of the industries for which the different sections cater.

Correspondence

SKILL WHERE IT'S NEEDED

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Mr. David Epstein's rather naïve letter in your JOURNAL dated February 16, cannot go unchallenged; such views do the foundry industry great dis-service.

Does the use of cold-setting corebinders take away the need for skill in making cores? Does a core-shooter simplify a core; or is it that the core-shooter needs the simplified core? Does a 'slinger simplify the moulding of an intricate casting; or is it that the 'slinger does the slogging, and the skilled moulder steps in when the going gets tricky? Does mechanization simplify moulding? Is it not rather that the mould is simplified to suit mechanization?

Is the average coremaker or moulder required to know less or have less skill than 10 or 20 years ago? How much "push-button technique" or how many "tinned ideas" went into the making of the casting pictured on page 220 of the issue of the JOURNAL which contained Mr. Epstein's letter? Your caption, quite rightly, describes that job as difficult, but such castings are required of steel and iron foundries as a matter of course. Engineers frequently require castings of this type the design of which precludes all other processes. In the range of smaller castings, both ferrous and non-ferrous, even greater intricacy is expected.

Anyone who has had to do with the foundry industry during the last 30 years must acknowledge the valuable contribution that science and technology have made towards greater efficiency. Basic materials, unpredictable because of nature's infinite variety, have been standardized by the sand technician and metallurgist to the great advantage of the foundry process. The plant engineer has lightened the labour and lessened fatigue so that more is accomplished in a given time. The foundry is a safer and cleaner place to work in and, most valuable of all, the foundryman not only knows that certain actions will bring certain results, but he can find out, if he takes the trouble, why such results are obtained.

An Alternative Conception

In the mechanized field, where skilled operations are ruthlessly excluded in the interests of mass production, standardization has the greatest effect. The combined efforts of technology and science have had a revolutionary influence resulting in a startling improvement in production and quality. Such success has led technicians into the error of thinking that similar results can be obtained throughout the industry. It is my view that work produced by mechanized plant is but the smaller portion of the scope of the foundry trade as a whole; that the simplification necessary brings this application into direct competition with cheaper and slicker processes; and that the work so produced is not truly representative of that which justifies the foundry in its position as one of the major industries.

It is necessary to answer your correspondent in detail, but it is difficult to catalogue all the facets of skill that go to the making of a typical casting, as distinct from pure technical "know-how." These are some of the more obvious ones:—Interpretation of a drawing between engineers and foundryman; tentative propositions for moulding procedure; making of the pattern; preparation of bed or pit (anticipating mould venting and reinforcement or the choice of moulding box); the design and making of grids for moulds and cores and arranging for mobility of large masses, where necessary, without distortion; the making of the mould proper, with adequate venting and reinforcement; the correct jointing of the mould requiring, maybe, three-part or multi-part application; providing the right sand for the particular job (whose department is this, I wonder?), and last but not least, the many tricks learned to correct the slight mishaps which always occur, and a more than passing interest in running, feeding, and pouring.

The technician and scientist have done much to provide the foundryman with positive information of the phenomena attendant on his job; but the application of this information must be made in the light of experience and practice developed from one job to another. *i.e., skill.* The plant engineer and metallurgist have brought control of the furnace and cupola to near-perfection, but a good furnaceman or cupola chargehand is still "worth his weight in gold." Technical and metallurgical investigation have given the moulder a clearer insight into the phenomena associated with the running and feeding of a casting; but only the skilled foundryman has the experience to apply these theories to a given job.

It is within my personal experience that some foundries are deliberately refusing the skilled class of job because of a shortage of skilled men; preferring the job which can be mechanized or "plated" in some form. This is particularly so in foundries supplying blackheart malleable and certain grey-iron foundries. I am sure that the shortage of skilled operators is due to failure to recruit apprentices of the right type. Such apprentices are highly intelligent wih a good deal of pride and a strong creative sense. They will not be attracted to a trade if their services are undervalued and their work accepted on sufferance—an impression not likely to be corrected by such sweeping statements as your correspondent has made.

There is a vast field of engineering the requirements of which cannot be met by the modern techniques of automation, mechanization or scientific dissection. I believe that the foundry is eminently suited to supply this field, but only if it preserves, fosters, and develops the old skills which have brought it to its present prominence. If foundries persist in the trend to standardize for mechanization, and deprecate skill (thereby losing their versatility) engineers will be forced to seek less-satisfactory means of production for their needs. The foundry industry will find itself handicapped in competition with processes and materials *born* of mass-production techniques; and will be left trailing behind. The inevitable result will be that there will not be enough work to feed all the mechanized plants laid down at such great expense.

Your caption: "Skill where it's Needed" is very apt.

Yours etc.,

W. H. BOND.

Birmingham 6.
February 24, 1961.

Industrial Finishes Convention and Exhibition

Running concurrently this year at Earls Court, London, from May 8 to 11 are the First International Industrial Finishes Convention and the First International Industrial Finishes Exhibition. It is intended that these events should serve as focal points for the discussion of finishing progress in all branches of industry. The programme of technical papers has not yet been finalised but it will include a paper by Dr. B. K. Niklewski on "Vitreous Enamel Developments."

Influence of the Silicon in Cast Iron on Corrosive Wear

*Discussion of the Paper by R. Graham, B.Sc., Ph.D., O. S. Prado, M. H. Collins, B.Sc., Ph.D., E. A. Brandes, B.Sc., and H. K. Farmery, M.A., Ph.D.**

When a paper, read to the Institute of Mechanical Engineers, relating silicon in cast iron to corrosive wear, was printed in the JOURNAL last year† it not surprisingly posed a number of questions in the minds of foundrymen and research workers connected with the industry. It was realized at the time of publication that these questions, connected partly with the interpretation of the results and their relevance to current foundry practice, would result in controversy as well as appreciation. In the following, points of criticism are made, experimental work is described, and Authors' replies are recorded.

The interest aroused by the publication of the paper "Influence of the Silicon in Cast Iron on Corrosive Wear" has been widespread among foundrymen and users of engine castings, as will be readily conceded from the ensuing contributions. The implications of the original and rather challenging work carried out by the Authors, could have important practical consequences for certain sections of the ironfoundry industry and the communications, printed below, from correspondents closely concerned with the problems raised, may help to put the issue as it stands at the moment, into better perspective for founders.

Practical Significance

MR. R. J. BROWN, A.M.I., MECH.E., wrote that the findings of the Authors were most interesting from an academic standpoint, but it was difficult to see what was the practical significance in relation to the general production of motor vehicles. Their statement in the discussion that silicon content was selected in order to produce an iron having a desired microstructure which facilitated the production of sound castings was certainly correct, and machinable castings should be added; he was not certain that it was generally assumed that increase in silicon was associated with increase in corrosion resistance, at least so far as motor-car cylinder blocks was concerned. The suggestion that in order to ensure corrosion resistance the silicon content should not exceed one per cent. would lead, by normal methods of casting, to the production either of extremely hard and unmachinable castings due to chilling, or to unsound castings if the carbon content was increased sufficiently to suppress the retention of free carbides. However, he would support the suggestion that further work on the mechanism of the corrosion of cast iron was required, both when used for the production of cylinder blocks and cylinder liners, and on an even wider basis.

Enamelling and Firebars

MR. T. H. CAULFIELD (*Falkirk*) wrote that light-castings manufacturers had long recognized that weathering of graphitic irons resulted in interstitial oxidation. That type of corrosive wear followed along the graphite planes. One important manifestation was in the "boiling out" experienced in enamelling, where, on the temperature being raised, iron oxide and graphite in close proximity reacted to give off carbon oxides which penetrated the enamel. If such an iron was not destined for enamelling the effect might never be noticed for after the initial oxidation it proceeded only very slowly. An extension of that effect was seen in fire bars, which were generally of the same composition. There, the iron became progressively oxidized internally along the graphite interstices (the graphite being burnt out in the process) and as iron gave rise to iron oxide, *in situ*, expansion occurred. Both of those effects could be reduced by reducing the graphite, or by dispersing it. Thus the effect could be related to the amount and state of the graphite present. With light-castings metal, carbon, and silicon were present in the ranges 3.0 to 3.2 per cent. and 2.5 to 3.2 per cent. respectively, and the metal was graphitic. With higher-carbon irons (acid-resistant irons) the metal was austenitic or ferritic. The silicon at any rate had thrown graphite completely out of the system and those irons did not have a surface structure which permitted of penetration under atmospheric pressure. With low-silicon irons the metal was pearlitic mainly, and graphite was only acceptable in diesel-engine metal because of the lubricating surface which it gave initially and the pitting of which permitted oil-film retention. Thus, if diesel metal was considered in the light of light-castings metal it would be seen that in the former, soluble sulphates were formed along graphite planes when in the latter, oxides resulted. It followed that any system which reduced the chance of penetration along those planes would reduce corrosion. It would appear, therefore, to be a point of determining the critical values for graphite along with hardness, and aiming

* Reproduced by courtesy of the Institution of Mechanical Engineers.

† June 30, 1960, p. 805. (To facilitate reference, figure and table numbers follow consecutively on those of the original article.)

at a composition which would yield the desired microstructure.

The paper was entitled "The Influence of Silicon, etc." It might better have been termed the influence of composition since the total carbon content varied over a wide range, and fell as silicon increased.

Other Data

MR. H. H. COLLINS* (*Birmingham*) wrote that the work was novel in that it suggested, not only that the corrosion resistance of cast iron depended on the comparison to a greater extent than had hitherto been thought, but also that the presence of normal amounts of silicon was deleterious. It had always been believed that the composition of cast iron had a relatively small effect upon its corrosion resistance compared with the effect exercised by the microstructure, and whenever the influence of silicon had been considered it had been thought to be beneficial since corrosion would release the relatively voluminous silica which would aid in blocking any graphitic residue developed on the corroding surface with the final stifling of the attack. Apparently, however, that effect was unimportant at normal silicon levels since not until 14 per cent. silicon was present was an alloy produced which was highly resistant to acid attack, and that increase in corrosion resistance then occurred abruptly. For example, even in an alloy containing about six per cent. silicon (Silal) corrosion rates in one and five per cent. sulphuric acid at room temperature of 833 and 705 mdd.† had been reported as compared with 1060 mdd. and 930 mdd. for cast iron, which was a relatively small improvement. Higgins and Westwood‡ had shown that a two per cent. silicon steel corroded in 10 per cent. sulphuric acid at 100 deg. F. at 3 by 10^4 mdd. while a 4.8 per cent. carbon, 0.2 per cent. silicon cast iron corroded at a rate similar to that of a 3.4 per cent. carbon, 1.9 per cent. silicon cast iron, *i.e.*, 2 by 10^4 mdd. According to Rylands and Jenkinson‡ 0.2 per cent. carbon, 0.1 per cent. silicon steel corroded under those conditions at 5 by 10^4 mdd. At concentrations and temperatures approaching those of the present Authors those workers also showed that 0.1 per cent. silicon steel always corroded more rapidly than the 1.9 per cent. silicon cast iron. Those data indicated the novelty of the suggestion that a low silicon content was beneficial for an iron which required a high resistance to corrosion by sulphuric acid. They were not necessarily inconsistent with the Authors' work, however, since that was carried out at somewhat different acid concentrations and temperatures. Whether the conditions of the laboratory test chosen by the Authors were more typical of those normally pertaining on the cylinder wall of a diesel engine or on the combustion side of a boiler wall was perhaps debatable, but the fact that the Authors had produced qualitatively similar effects in controlled tests reproducing more closely the precise conditions occurring in a diesel-engine cylinder and on a boiler surface suggested that the behaviour of an iron in service could be inferred from its behaviour in such a laboratory test.

The absence of results derived from a study of typical engine irons made it difficult to say how important the effect of silicon was when it was associated with other variations in the composition as well as large variations in the structure. Moreover, from the analyses quoted in Table 1 it was clear that it was possible to make out nearly as good a case for a correlation of corrosion resistance with total carbon content or carbon equivalent value, as for a correlation with silicon content. Again, the amount and distribution of graphite in a cast iron might be expected to have a considerable influence on the progress of corrosion but no data on the graphite content of the test irons were quoted. Accordingly the British Cast Iron Research Association had decided to make a brief study of the corrosion.

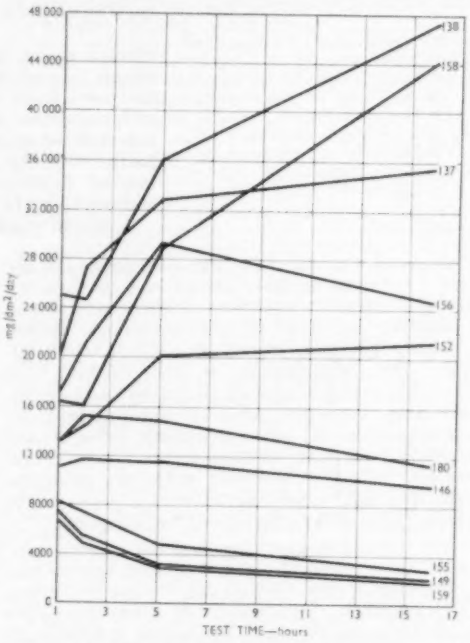


FIG. 11.—*Variation of corrosion rates derived from Table 2 of the Author's previously published paper, plotted against test-time.*

Liner-metal Tests

Single samples, taken from 12 different liners of different analyses and structures, were exposed in five litres of 10 per cent. sulphuric acid controlled at 130 deg. C. ±2 deg. C. by the use of a chromel/

* On behalf of the British Cast Iron Research Association.

† Milligrammes per sq. decimetre per day.

‡ Proc. Inst. Mech. Engrs. Lond. 1948, **158** 421, 405, discussion

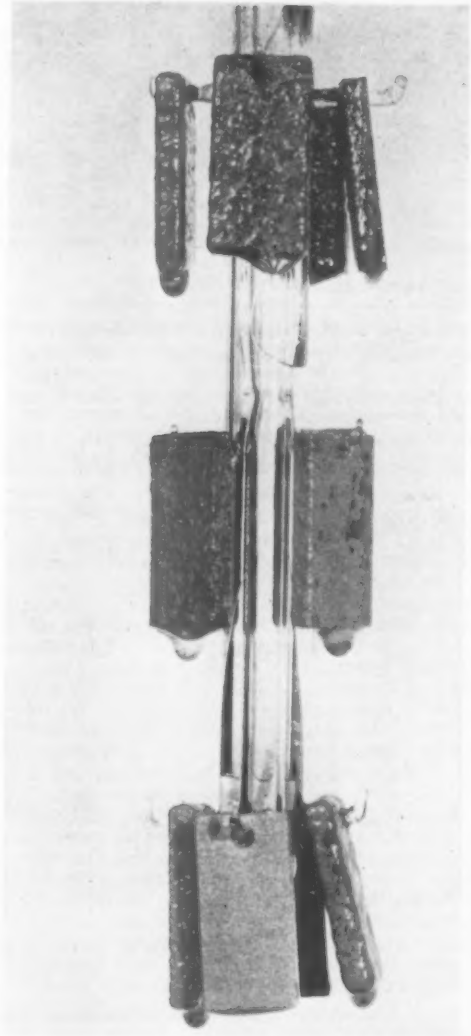


FIG. 12.—*Appearance of specimens immediately after removal from sulphuric acid. The clean surface at the bottom centre should be noted. As a control on results, the experiment was repeated three times with the radial clusters occupying different positions.*

alumel thermocouple and a Kent recorder. They were carried in three sets of four, one above the other, on radial glass hooks fixed to the thermocouple jacket. Three tests were carried out using replicate samples in fresh acid solutions, and the relative position of the three sets was changed each time to eliminate any positional effect. At the end of four hours' immersion in the acid, the samples were removed, washed with water and alcohol, and the loosely adherent corrosion residue was removed by rubbing lightly with a dry cloth. The specimens used were 1 in. by $\frac{1}{2}$ in. by $\frac{1}{4}$ in. with a $\frac{1}{8}$-in. dia. hole in one end through which the suspending hook passed. The corrosion was assessed by the loss in weight of the specimens. Table 7 contained all the information currently available about those materials and their weight loss in that test.

Graphite-flake Size

It would be observed that there was no correlation of weight loss with total, graphitic or combined carbon content or with carbon equivalent value. The best correlation that could be made was with graphite flake size. The flake size and the silicon content were both related to the casting section size but the tests carried out by the Authors of the article, on the specially prepared series of alloys, showed that a reduction in weight loss could be effected by reducing the silicon content without altering the graphite size although it was probable that there was an appreciable variation in the amount and distribution of the graphite throughout that series. The correlation with silicon content in those tests on *real* liner metal, however, was not so good. Essentially, the results fell into two groups: those with medium- and fine-flake graphite containing 2.9 to 1.8 per cent. silicon had poor corrosion resistance, while those with coarse-flake graphite containing 1.3 to 0.7 per cent. silicon had better corrosion resistance.

Corrosion Rate

Fig. 11 was a plot of the corrosion rates derived from Table 2 against the test time. It would be noted that irons of good resistance to attack had corrosion rates which decreased with time, while irons with poor resistance to attack had corrosion rates which increased with time. That suggested that the rate of corrosion was controlled by the development of a surface film of corrosion residue, and corrosion products, which was relatively stifling in some cases, but more readily penetrated by acid in others. It was difficult to see how a reduction in the silicon content of the iron could lead to the development of such a film, particularly if it was divorced from any other structural or compositional changes in the iron. A curious observation made during the work on this topic was that two samples of liners which contained very fine graphite clusters evolved hydrogen very rapidly, while no other samples evolved appreciable quantities of hydrogen. Fig. 12 showed the samples immediately after extraction from the acid. The clean appearance of one of the " gassing " samples (bottom front) might be contrasted with those of the other samples which all carried some corrosion residue. Those two samples did not exhibit the most rapid corrosion rates and that suggested that some process other than hydrogen evolution might occur under those conditions which was capable of supporting very high rates of corrosion. Clearly that aspect was worth studying in more-quantitative detail.

Silicon in Iron and Corrosive Wear—Discussion

Some cylinder-wear data were available for the samples designated No. 2 Unit, C/TL and C/BL 65 and C/TL and C/BL 293 and those were quoted for interest in Table 6. Those liners were used in marine engines under closely controlled conditions of installation and use and operated with the same grade of high-sulphur fuel oil. It would be noted that those data did not correspond closely to the mean corrosion data given in Table 6. Moreover, micrographic evidence suggested that the materials referred to as No. 2 Unit, C/TL 65 and C/BL 65 contained appreciably more free carbide than the material C/TL 293 and C/BL 293. The difference in the average wear of those two groups (0.009 in. per 1,000 hr. as against 0.018 in. per 1,000 hr.) corresponded broadly with that structural difference, but the differences in weight loss due to *corrosion alone* which were observed were apparently quite independent of the amount of free carbide present. That suggested that, at least in that type of engine operating on a high-sulphur fuel oil, the *corrosion resistance* of the metal was not the most important factor affecting wear.

TABLE 7.—*Details of Alloys Used in BCIRA Tests.*

Sample	M19	M265	M492	D27287	D31003	D31285/2	D31424	No.2Unit	C/TL65	C/BL65	C/TL293	C/BL293
Section, in.	0.35	0.33	0.33	0.23	0.20	0.33	0.45	2¼	1¼	2	2	2
Structure: Graphite	Medium flake	Very fine clusters	Fine flake	Very fine clusters	Fine flake	Fine flake	Medium flake	Coarse flake	Coarse flake	Coarse flake	Coarse flake	Coarse flake
ASTM class	5E	7A	5A	6A	6–7B	6A	4A	2A	3A	3–4A	3A	3–4A
Matrix	Pearlitic	Pearlitic	Martensitic	Pearlitic	Martensitic	Pearlitic	Pearlitic	Pearlitic	Pearlitic	Pearlitic	Pearlitic	Pearlitic
Others	Good phosphide network	Much carbide	Some phosphide lakes	Some carbide	Some phosphide	Some phosphide	Some phosphide	Some carbide	Small amount of carbide plus phosphide	Small amount of carbide plus phosphide	Small amount of phosphide	Small amount of phosphide
Analysis, per cent:												
Total carbon	3.10	2.70	3.34	3.03	3.29	3.31	2.97	3.30	3.31	3.33	3.10	3.36
Graphitic carbon	2.29	1.62	2.38	2.54	2.31	2.51	2.10	2.19	2.34	2.36	2.53	2.34
Combined carbon	0.81	0.98	0.96	0.49	0.98	0.80	0.87	1.11	0.97	0.97	0.57	1.02
Silicon	2.91	2.75	2.38	2.15	2.53	2.12	1.74	0.68	0.69	1.28	1.02	0.99
Manganese	0.85	0.80	0.81	0.79	0.92	0.67	1.14	0.88	0.85	0.63	0.82	0.92
Sulphur	0.036	0.059	0.048	0.058	0.034	0.055	0.113	0.120	0.108	0.104	0.101	0.103
Phosphorus	0.72	0.24	0.18	0.33	0.92	0.17	0.19	0.14	0.25	0.49	0.18	0.15
Nickel	0.22	0.07	0.03	0.02	0.035	0.74	<0.005	0.08	0.05	0.04	0.04	0.07
Chromium	0.80	1.64	0.23	1.01	0.2	0.28	0.06	0.08	0.05	0.05	0.16	0.17
Molybdenum	<0.02	<0.02	0.39	<0.02	<0.02	0.24	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	0.15	0.11	0.15	0.15	0.15	0.29	0.01	0.07	0.03	0.04	0.14	0.10
Vanadium	0.05	0.02	0.01	0.27	0.07	0.015	<0.01	0.11	0.12	0.10	0.01	0.01
Corrosion test results, weight loss after 4 hr. in 70 per cent. sulphuric acid at 130 deg. C.	0.321 0.332 0.350	0.305 0.303 0.313	0.434 0.430 0.523	0.347 0.378 0.423	0.331 0.345 0.373	0.348 0.366 0.372	0.480 0.429 0.434	0.120 0.166 0.115	0.090 0.084 0.089	0.167 0.169 0.172	0.172 0.120 0.170	0.195 0.164 0.201
Mean weight loss	0.334	0.307	0.461	0.383	0.350	0.359	0.448	0.134	0.088	0.169	0.171	0.187
Wear rate (0.001 in. per 1,000 hr.)	—	—	—	—	—	—	—	7 (6,720hr)	8 (2,690hr)	13 (2,690hr)	20 (2,825hr)	16 (2,825hr)

Limited Application

In considering the practical relevance of that work it must be borne in mind that castings of section less than 1½ in. would be difficult to make in an iron containing less than one per cent. silicon; while diesel engine castings whose section was greater than 1½ in. had necessarily to be made in an iron of low silicon content if an acceptable structure was to be obtained. It followed, therefore, that only a limited group of manufacturers would be able to take advantage of the apparent benefits conferred by the low silicon content and the greater part of those manufacturers would, in fact, be already using that type of iron for other reasons.

None of his comments and criticisms should, however, be allowed to detract in any measure from the very considerable interest and value of the most original observations contained in that important paper.

Request for Data

COMPAGNIE GENERALE DES CONDUITES D'EAU (*Liège*) wrote that they manufactured castings for steam generating plant whose destruction was

initiated by sulphuric-acid corrosion. In order to be able to relate the Authors' experiments to their problem, they would like to have the following information: *Top ring test* (Table 5). In which section of casting had the test-pieces been taken from? and whether for each casting it concerned the portion 1½, 2½, or 3½-in. dia. *Boiler combustion-rig test.* Had the test-pieces been taken off the same piece, as for the top-ring test, or from which section?

What were the weight losses of each sample (actual weight losses non-corrected)?

How was a correction of position-effect established? Were the Authors sure of the exactness of the correction?

They would await the Authors' replies with great interest, especially for the boiler combustion-rig test, because the difference of only ±20 per cent. on the average (corrected) of the three samples did not permit the formation of an opinion on the real effect of the silicon content, without knowing the figures of the actual test results.

Caution

DR. L. HARRISON (*Chesterfield*) wrote that the Authors' findings were likely to have far-reaching consequences but at this stage they should be interpreted with caution by design engineers. The provision of an iron containing a maximum of one per cent. silicon, as suggested by the Authors, could give rise to practical difficulty for the foundryman particularly on relatively thin-section liner castings. To obtain a satisfactory microstructure with such a low silicon content the iron must contain a high percentage of carbon and that could result in an increased metal cost owing to the necessity for special pig irons and reduced amounts of scrap in the charge. On the other hand, the production of a low silicon iron without reference to microstructure might result in a liner which, although it had increased resistance to corrosive attack, was inferior in other respects. The Authors had quite rightly arranged in their work to eliminate the effect of variation in microstructure but the means by which they had done that had been somewhat artificial and more suitable for experimental work than casting production.

As indicated in the paper there was a considerable amount of work still to be done before the situation could be truly assessed and it might well be that the introduction of minor additions of alloying elements was sufficient to offset the harmful effect of the higher silicon content.

Role of Carbon

MR. J. R. JENKINSON (*Wakefield*) wrote that the paper appeared to prove that cast irons with very low silicon content were essential to resist simple erosion and corrosive wear in oil engines. The problem and conclusions had been oversimplified, and could be very misleading to manufacturers who followed the suggestions made. From the analysis in Table 2, it would have been quite legitimate to have said that the higher the carbon in the cast iron the better the corrosion and erosion resistance would be, but the carefully controlled total carbon had received very little discussion in the paper; furthemore, it was stated that other differences compared with silicon were unimportant, and it was intended that that statement should be accepted without any proof. Most metallurgists realized that the silicon content was important in that it had an effect on other constituents, and it was that effect, rather than as a solid solution, that produced the final qualities in the finished iron. Great care was taken using a high-frequency induction furnace to produce a pearlitic structure with graphite flakes of a certain size. No mention was made that the excess carbon, beyond that required for the pearlite, would be as graphite, and it was probable that the graphite present was largely responsible for the low results obtained in the tests. For example, in Table 5 with a fuel oil of 0.1 per cent. sulphur with additive-producing minimum corrosion, the low-silicon rings gave the low results, but it was perfectly logical to say that those results were obtained because the excess graphite in the specimens helped to produce an ideal lubricant. The same effect would occur even in the presence of acid. Surprise was indicated that the boiler combustion-rig tests did not quite agree with the wear tests. If more attention had been paid to previous work on the effect of silicic acid in the presence of sulphuric acid, the results shown in Fig. 10 would have been more enlightening to the Authors of the paper. The corrosion experiments using 5 ml of 70 per cent. sulphuric acid were misleading, for the small quantity of acid used would gradually change in strength, and produce results not intended by the Authors. Many of the results, such as those in Fig. 6, could be explained if some notice had been taken of the changing conditions.

Manufacturers of low-temperature heat-exchangers for boilers should take no notice of the advice given on p. 9, where it was stated that more emphasis should be placed on the desirability of low silicon content, but should produce castings with silicon content between two and three per cent., and if they attempted to reduce the silicon to 0.5 per cent. they would be surrounded with a host of difficult problems both in the foundry and in the field. Good engine-cylinder liners were made of special irons to give the desired composition and structure, and the techniques used bore no relation to the way in which the test pieces described in the paper were prepared.

Physical Properties

MR. J. E. ROBINSON, M.I.MECH.E., wrote that there would appear to be a need for further investigation before any practical value could arise. The paper had raised a number of questions relating to methods of investigation, and he would be glad to have the Authors' reply to the following points: No mention was made of the influence on corrosive wear of materials with the additions of nickel, chromium, or molybdenum, yet almost all modern piston rings were made of irons containing those elements.

Silicon in Iron and Corrosive Wear—Discussion

Referring to the engines tests, it was most disappointing that wear figures on the liners, working in conjunction with the subject rings, were not given. In his firm's investigations they found it essential to consider the combined wear rate rather than the rate of only one component. No mention was made of the wear rate on normal ring material such as 4K6 or DTD.485, in similar engine tests as outlined in Table 3. He would be glad if the Authors would include such data in their reply. With reference to the two materials (101 and 106) tested, they would have expected some differences in the graphite size and distribution. Since that could have had some bearing on the weight loss due to surface "plucking" of the material, he would like the Authors' further comments as to the possibility of that affecting the validity of the results obtained. He would also like to have the Authors' views as to the relative influence of the equivalent graphite of the material.

En. Values

No mention was made in the paper regarding the physical properties of the rings tested, and he felt that it was essential for the Authors to give details of the En. value, breaking stress, hardness and ring collapse; also the surface finish of the rings should be given to enable comparisons to be made with normal ring-wear figures. As was well known, the different En. values would give varying wall pressures, and whilst it was agreed that maximum cylinder pressures had a greater influence on the wear rates than did ring-wall pressures, his firm's work suggested that the latter had a considerable bearing on relative wear rates. It would be of considerable value for the Authors to give the En. values of materials 101 and 106, so that these could be related to the wear figures obtained.

Wear Data

He would also suggest that the actual methods of manufacturing the rings should be given in the reply, since that could also have a considerable influence on the comparable wear rate with correctly made rings. It could be argued that that had little bearing on the comparisons made in the paper, but it must be appreciated that the materials used had to be capable of satisfactory manufacture. He would also welcome the Authors' comments regarding the ratio between peripheral and side wear of the rings tested, and also whether the piston ring groove wear was noticeable. Most of the work carried out with high-sulphur fuels had shown that ring groove and ring side wear had been more severe than the peripheral wear, and he would like to know if that had been established in that particular series of tests. He felt it was essential for the Authors to make some reference to the effect on the wear rates of the lower ring pack by the fitting of a chromium-plated top ring, since it was generally agreed that that gave an adequate life to the whole ring assembly, even when using high-sulphur fuels.

There was no doubt that the work would be of considerable interest to both engine makers and engine users, but he felt sure that the Authors would agree that there was need for considerably more research before any engine was made in the constitution of materials currently employed for both piston rings and cylinder liners.

Role of Graphite

MR. N. TOMMIS (*Bradford*) wrote that it would appear that the initial object of the paper was to find an explanation of the variations in wear rates experienced in marine diesel engines running on high-sulphur fuel oils. He felt, however, that before practical use could be made of the results obtained, further investigation was needed, and the Authors' replies to the following points would be greatly appreciated: He noted that in the test pieces cast for the corrosion tests, attempts had been made to control the graphite size and also the structure of the matrix mainly by the adjustment of the carbon content to balance the variations in silicon content, as by the Maurer-type diagram shown in the article. That led to a decreasing carbon-equivalent value with increasing silicon content, and it was felt that that would also have led to a decrease in the amount of graphitic carbon and possibly a varying eutectic-cell size with increasing silicon content. He would like to have the Authors' views on the influence of a decreasing amount of graphitic carbon on the corrosion resistance when expressed as a "loss in weight."

Larger Engine

For a number of years his company had produced the larger sand-cast marine-engine piston rings with total carbon contents of 3.5 to 3.7 per cent. and silicon contents between 0.8 and 1.5 per cent. Such a casting composition was not, however, practical for the production of the smaller diesel engine rings used, for example, in road transport vehicles and also for many stationary installations. Whilst the paper mainly dealt with marine applications, it would appear that the Authors also suggested that some improvement could, in fact, be achieved by the use of low-silicon cast irons in engines using the current low-sulphur fuel oils.

Testing Period

In Table 5 were given the weight loss results of low-silicon and high-silicon rings run for 40-hr. periods in test engines. He would be glad if the Authors would state whether the wear rates would be maintained with further running periods. It would also be interesting to receive the Authors' comments on the differences in microstructure between the two materials (Nos. 101 and 106) tested, particularly in respect of the graphitic carbon content of the material and also in the form and distribution of the graphite flake, since he felt that that could have some bearing on the weight losses due to surface "plucking" effects. He would also be glad to have details of En. values, ring breaking stresses, radial pressures, hardness, heat-collapse characteristics, and also surface finish, as those all had considerable bearing on the wear rates. With regard to the ring weight loss figures quoted,

he noted that no mention was made of comparative wear rates of conventional ring materials, such as those to 4K6 or DTD.485 specifications. He would be glad if the Authors would include such information in their reply. That might give some indication of the influence of corrosive and abrasive wear on materials with additions of nickel, chromium, and molybdenum, either singly or in combination. The Authors' views on the influence of those alloying elements which were normally present in modern piston rings, would be appreciated.

Microstructure

MR. T. R. TWIGGER, A.M.I.MECH.E., wrote that the Authors had undoubtedly tried to track down systematically something which arose in the course of general investigations, and which appeared to have considerable importance, notably in connection with cylinder-bore wear. He would like to point out that cylinder-bore wear had been very greatly reduced over the past 20 years by better engineering, better control of cylinder wall temperatures, better oils, and, perhaps most notably by the use of chromium-plated compression rings. In road-transport diesel engines it was not uncommon for engines to have a life of 200,000 miles before reconditioning. The Authors evidently recognized the difficulty of isolating the effect of silicon upon corrosion resistance, as they had mentioned that the diesel engine liners first examined differed in other respects, such as composition and microstructure. When it came to the special cast irons made up for the purpose of the experimental work, he found it impossible to believe that samples ranging between total carbon 3.96 per cent. and silicon 0.59 per cent., and, on the other hand, total carbon 2.06 per cent. with silicon 2.96 per cent. could possibly have the same general microstructure, *i.e.*, quantity, size, and distribution of the graphite, pearlite form, etc. Making suitable allowances for the amount of combined carbon in the various samples, it was clear that the amount of graphitic carbon would vary very considerably, and that would be expected to be accompanied by considerable differences in graphite size and distribution. There were, of course, other marked differences in composition, that is, manganese, also notable differences in sulphur and phosphorus contents. Further, the composition range differed widely from that usual for either cylinder liners or piston rings in the road vehicle field and in some cases considerably larger engines where the material was centrifugally cast, and thus had a structure notably different from any of the materials tested by the Authors. In particular, an addition of 0.4-0.5 per cent. chromium was very common in conjunction with a silicon content of about 2.2 per cent. He suggested that such material might show up very differently. It must, of course, be realized that it would be quite impossible to make useable machineable casting with some of the low-silicon compositions used by the Authors, whatever their corrosion resistance might be. Possibly corrosion tests on steels of constant carbon and varying silicon content might give more useful information on the effect of silicon by itself, thus avoiding all the many complications which had arisen through the use of the materials chosen for those particular investigations.

Large Engines

MR. W. UCHMIR (*Augsburg*) wrote that he would like to state that the problem of the corrosive cylinder liner wear with large diesel engines might be considered as solved by the selection of an adequate alloy, as well as by the use of high-alkaline lubricating oils. He doubted whether the experiments carried out by the Authors would also be valid under the service conditions of large diesel engines.

Critical Points

MR. H. J. YOUNG, M.I.MECH.E., wrote that the study of grey cast iron and particularly of its wear when used as cylinder liners or piston rings in aero, automobile, submarine, marine and stationary engines of all sizes and including wet steam, dry-super-heated steam, diesel and compression-ignition engines ranging from motor-cycles to the largest ocean-going ships, had been one of his own occupations for 40 years during which time he had contributed six or more papers concerning the problem to five or more scientific bodies. Such study made one very humble as the vastness of the subject and the meagreness of one's own knowledge became apparent. The Authors' paper, however, puzzled him extremely because they appeared to know for a certainty many of those matters which he did not know and which he had not before found anyone else positive about. Indeed, the paper appeared to him to consist of little else than statements of that kind without, as he could see, evidence to support them. Taking them as they occurred in the text: (1) "Boundary lubrication obtains over a significant part of the operating cycle." He wondered whether that meant that there was an insignificant part of the cycle where some other than boundary lubrication existed. (2) "The intrinsic wear resistance of the liner material, therefore, affects the wear rate." He questioned the word "therefore" in the middle of that sentence, and wondered what "intrinsic wear resistance" meant, whether there was what might be called a "non-intrinsic wear resistance," if so what was the difference. Further, was it not a fact that to speak of wear resistance and wear rate in one short sentence is merely to "synonymize"? (3) "There is general agreement about the type of cylinder liner material which gives good intrinsic wear resistance to abrasion." He had never met any general agreement; instead, he had been responsible for supplying liners to numbers of the leading engine makers of the world, which liners had been of vastly different composition as followed: (*a*) high nickel non-magnetic non-corrosive cast iron; (*b*) abnormally high sulphur-content cast iron (nearly 0.5 per cent.), some important engine manufacturers had used that quite recently; (*c*) cast irons where the control of structure was

achieved by chromium instead of silicon; (*d*) "Lanz Perlit" cast iron with a silicon-content of 0.5 per cent. or less; (*e*) "Vacrit" cast iron of all-sorbitic structure containing chromium, vanadium, and titanium; (*f*) loaded cast irons having an abnormally high silicon-content (say, between 3.0 and 5.0 per cent.) and structurally controlled by chromium; (*g*) ordinary non-alloy cast irons where the structure was controlled by silicon-content to suit the casting-thickness. The above-mentioned types of cylinder liner material were specified by leading engine-makers and users everywhere. (4) "but liners were also subject to chemical attack under some engine conditions. There seemed to be little information on this aspect of wear." On the contrary, there had been a large amount of thought and experiment on that aspect of wear and a number of papers had been read. He himself had contributed one entitled "Corrosion by Oil" and another "Undue Cylinder Wear." Insignificant as might have been his own work he could call to mind a fine research done by Mr. Williams then head of the Automobile Engineers' Association's research department. For the Authors' consideration he suggested that the results of using light lubricants confirmed some if not all of the work done then. (5) "A laboratory test in which the cast iron was exposed, in the absence of a lubricant, to the acid condensate which might, in some circumstances, form in a diesel cylinder." He wondered whether dry cast iron (not previously saturated with lubricant) was exposed to a laboratory-concocted acidified fluid such as the Authors inferred occurred in a diesel cylinder and that the test bore a similarity to actual working conditions and materials when working? He himself had had charge of many different types of corrosion tests relating to various materials and conditions of service and had always found that the extreme difficulty was to reproduce in a laboratory what actually occurred in practice and that if it was found impossible to reproduce it then the results obtained referred only to the tests and to nothing else, certainly not to practice. (6) "The initial results from these tests, whilst severe, were not unreliable." To acquire any meaning from the above statement was not easy. He wondered, "reliable" in what way and by what standard and for what purpose. No condensate formed in a diesel cylinder could, by any stretch of his own imagination, produce "severe" results. The D.O.C. test, used thousands of times, particularly on work connected with motor ships, never gave more than what were called etchings, and those after hours of running.

Microstructure

However, passing from these odd matters to the crucial one, namely, the Authors' claim to have made two cast irons of "controlled microstructure" one of which had a silicon content double that of the other (two per cent. and only one per cent.). The following was non-alloy grey iron metallurgy: if a one-per-cent. silicon cast iron was put into a cylinder liner casting of a certain radial thickness and total mass, and then a two-per-cent. silicon iron poured into a precisely similar mould of the same cylinder liner, the final result *must* be two liners of different microstructure, different graphite size, shape, and distribution, and different results in practice or test of any kind. If, perchance, the Authors had produced a miracle, then the work of Professor Turner, Dr. J. E. Stead, and of all the investigators since was wrong and it must be learnt that the structure of ordinary non-alloy cast iron remained unchanged when the silicon-content was halved or doubled as the case might be. That was not so, the two irons could not be compared, they were quite different.

The Authors' paper concluded with the statement "minimum wear can only be achieved when both metal and lubricant are properly chosen." That massive platitude taken literally would demand a different metal and a different lubricant for each cylinder of each engine, because it was true that the wear varied from cylinder to cylinder no matter whether engines of cars, buses, taxis, lorries, tractors, submarines, tanks, motor boats, mechanical horses, motor ships, and tankers and so on were considered. The factors affecting wear were legion, the lubricant and the metal being but two of many. In order to demonstrate that two non-alloy grey cast irons were similar it would be essential to possess and compare the following photomicrographs at about the following magnifications: *Graphite:* at ×15, ×30, and ×300 diameters. *General structure:* at ×100 and by 1,000 diameters, including a skilful search for free ferrite also free cementite. *Phosphide network:* at ×50 diameters. *Grain size:* at ×50 or any magnification which revealed it.

He apologized for the length of his contribution but it was a metallurgical and chemical paper as its title showed, and it was as a metallurgist and chemist that he wrote about a subject he had studied for so long and about which he yet knew so little. He could not agree that the paper proved what its title suggested.

AUTHORS' REPLY

DR. R. GRAHAM, MR. O. S. PRADO, DR. M. H. COLLINS, MR. E. A. BRANDES and DR. H. K. FARMERY wrote, in reply to the communications, that as several contributors had raised the same or similar points, they proposed to deal with the discussion collectively. They also noted that the comments of some contributors answered queries put by others.

Further Experiments

Several of the contributors had suggested that further experiments be carried out to obtain a better understanding of the relative influences of the cast-iron constituents on its resistance to acid attack. They would, therefore, give briefly the results of some experiments which they had made for that purpose, since the paper was first sub-

mitted. They had made a set of fully-eutectoid steels of various silicon contents between 0.6 and 2.2 per cent. They had also made a similar set of carbon-free iron/silicon-alloys (silicon ferrites) with various silicon contents between 0.6 and 2.36 per cent. Those were exposed in the laboratory corrosion test which they had described, and the results were given in Fig. 13. The results showed conclusively that increasing the silicon in the ferrite over the range 0.6 to 2.36 per cent. gave a decrease in the resistance to attack. It was also clear that cementite and graphite both increased the attack. It was not the time or place to discuss those pre-

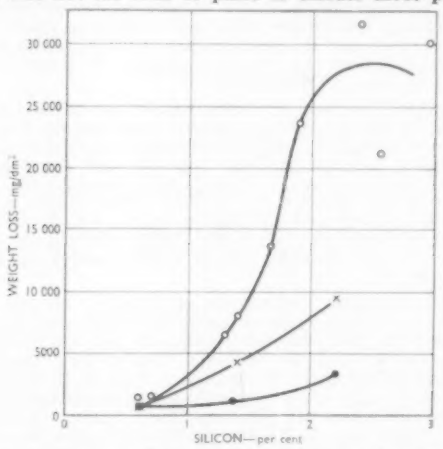


FIG. 13.—*Results of corrosion tests carried out on a set of carbon-free iron-silicon alloys and fully-eutectoid steels, subsequent to suggestions, following publication of the Authors' original paper. Key:* o—*cast iron;* ×—*eutectoid steel;* •—*ferrite.*

liminary results or their significance, they would only say that, in their opinion, the function of the carbon was to provide a cathode to the ferrite, so that, in addition to the chemical attack by the acid, there was an accelerating electrochemical or galvanic factor intensifying the attack. The amount of silicon seemed to be the basic factor, as was shown by their engine test results. There, the higher carbon, lower silicon irons, which contained rather more graphite were less attacked than the higher silicon lower carbon irons.

They agreed with those contributors who had stated that there was a need to establish the influence of other variables such as small quantities of other elements normally found in cast iron. They also agreed that the mechanism of attack required clarification. It was interesting to note that Fig. 11 (the data from Table 2) showed that the rate of attack for irons with a silicon content up to 1.0 per cent. was different from those containing 1.0 to 2.36 per cent.

Practice

Many of the contributors had commented on the problem of translating the results to practice. They agreed with their statements. It was, however, for individual manufacturers to decide whether or not the findings could be applied to the type of castings they were making. Clearly, very low-silicon irons, in thin sections and cast so that cooling was rapid, would be mottled or white. The discussion, however, showed that under some manufacturing conditions, irons of low silicon content could be made satisfactorily. They had been very interested by the results contributed in Table 7. When the figures for the weight loss were plotted against silicon content on Fig. 3, they fell parallel to their curve, although they were displaced upward. That, of course, would be expected because the corrosion test conditions were such that more acid was used. They themselves had looked into the matter of the amount of acid used in the test, though they had not reported it. They found that when larger quantities of acid were used and under reflux conditions at atmospheric pressure, the results came out in the same sense as those obtained from the sealed-tube experiments, though the weight loss was somewhat higher. They thought that the disparity in the wear figures, Table 7, might be attributed to the influence of carbides on the abrasive wear factor. They might also mention that it was, in part, the extreme difficulty in separating the abrasive and the corrosive wear factors in engine results which had led them, in the first instance, to undertake the work they had just reported.

Experimental Details

The rings used in the engine test were made by first boring the castings. That was followed by turning the outside diameter, after which the rings were parted off. They had then removed a section from the ring to make the gap. The split ring was then mounted in a jig so that the two ends were 0.002 in. apart and the outside diameter was ground. The ring was finished by grinding the side faces. The hardness of the higher carbon, lower silicon rings ranged from 190 to 210 Bhn., the lower carbon, higher silicon from 230 to 250 Bhn. They did not measure the En. value of the rings.

Testing Period

The rings were "run-in" in the engine over 40 hours under increasing speed and load conditions. They were weighed before and after running-in and they had not noticed any outstanding differences in weight loss between the rings at that stage. They had no definite information on the point, but it was their opinion that the rings would continue to wear at the rates quoted for the different test conditions. The wear rate of commercial rings, in the same engine, under normal conditions, varied, according to the information available to them, between 20 and 40 mg per 40-hr. test. The boiler-rig tests were planned and the results analysed, statistically. The technique of non-orthogonal analysis of variables was used to evaluate the positional effect and so average

Silicon in Iron and Corrosive Wear—Discussion

variations inherent in corrosion testing. They did not believe, therefore, that it would be of any advantage to quote individual weight losses.

They agreed with the contributors who had stated that the matter should be examined further. They had not replied to many points because they felt that those were more of the nature of the contents of a further programme of investigation and were extensions rather than discussions of the work reported. They hoped it had been made clear that the two irons from which the rings were made, although having different silicon contents, were both fully pearlitic, although the carbon and graphite contents differed. No allowance was made in the results for the rather greater graphite content of the low-silicon iron, even though that would, in their opinion, have tended to even out the weight losses due to condensate attack.

Company News

English Electric, Limited

Enlarging upon some significant figures in the breakdown of every £100 of 1960 sales turnover, Lord Nelson of Stafford, chairman of the English Electric Company, Limited, in his annual review, emphasizes that firms supplying raw materials or components must also concentrate on cost reduction. The breakdown shows that out of every £100 the cost of raw materials and manufactured accessories amounts to over £48. Lord Nelson maintains that firms supplying must share the responsibility of obtaining for this country some of the overseas business now being lost to foreign competitors.

He goes on to comment that the Government's medium term export credit insurance period is often not long enough for capital goods and too expensive as compared with facilities offered by other countries. What were previously regarded primarily as British markets were now scenes of intense international competition and many countries were progressively manufacturing the goods formerly bought from Britain. He welcomed these changes as he believed they offered even greater opportunities for export of capital goods in the future.

Output of the group for 1960 was almost identical with that for 1959, but orders booked last year were substantially higher than ever before and there were good prospects for an increased output in 1961. The establishment of factories in Canada, Australia, South Africa, and India enabled a selling organization to be maintained to meet the needs of those countries and to deal with special projects involving the importation of British equipment.

MATHER & PLATT, LIMITED—Group profits for 1960 were £1,316,774 (£1,522,972) but the dividend is maintained at 11 per cent., with an unchanged 8 per cent. final. After tax of £622,040 (£670,544), the net balance is down from £852,428 to £694,734.

STANDARD RANGE & FOUNDRY COMPANY, LIMITED—Final dividend of 13¼ per cent. makes 20 (equivalent 18.6) per cent. for 1960. Group net profits were £63,293 (£70,709), after tax of £63,012 (£51,723). The company was made public in October, 1959.

H. & J. HILL (WILLENHALL), LIMITED—With a 20 per cent. final total dividend for 1960 is being increased from 22½ per cent. to 27½ per cent. Profits rose from £14,994 to £41,433 and after tax of £20,090 (£6,681), the net balance is £21,343 against £8,313 previously.

FOLLSAIN, LIMITED (formerly Follsain-Wycliffe Foundries, Limited)—Final dividend of 10 per cent. makes 15 (12½) per cent. for 1960. It is proposed to make a one-for-three rights issue, at a price to be decided, to facilitate the expansion of the business. Group net profit was £38,832 (£21,435), after estimated tax of £45,003 (£21,377).

INCANDESCENT HEAT COMPANY, LIMITED—In connection with the formal offer for the ordinary capital by the Wellman Smith Owen Engineering Corporation, Limited, a one-for-one scrip issue is recommended. It is proposed that the new ordinary, other than holders of Incandescent who do not accept the offer, shall be allotted direct to Wellman.

B.H.D. ENGINEERS, LIMITED—For an undisclosed sum the company has bought the Constructional Engineering Company, Limited, Birmingham, and its subsidiaries, E. Tallis & Sons, Limited, and Adaptable Moulding Machine Company, Limited, from the executors of the late Mr. D. Howard Wood. The new board of Constructional Engineering is: Mr. F. Brian Holmes, chairman; Mr. F. H. Hoult, managing director; Mr. P. Rushworth, Mr. S. Farrer, and Mr. J. F. Wigley.

INTERNATIONAL COMBUSTION (HOLDINGS), LIMITED—Value of orders received during the year ended September 30, 1960, showed a reduction, but the overall prospect has recently improved considerably. Group output fell by about 13 per cent., but the turnover still remained high compared with the capital employed, states the chairman, Sir James Reid Young. Group net profit, was £1,027,898 (£1,728,639), after tax of £847,720 (£1,269,697), and the dividend is maintained at 30 per cent.

LAPORTE INDUSTRIES, LIMITED—With a view to the acquisition of not less than 90 per cent. of the issued share capital of Howards & Sons, Limited, the capital is to be increased to £16,041,250 by the creation of 472,500 additional 5½ per cent. cumulative second preference shares of £1 each and 2,137,500 ordinary shares of 10s. each. The capital is also to be further increased to £18,500,000 by the creation of 4,917,500 additional ordinary shares of 10s. each. An extraordinary meeting is to be held on March 13.

HALL-THERMOTANK, LIMITED—Despite intensifying competition, Mr. J. Willis, chairman, is confident that adverse factors such as the dearth of new ship construction and increased foreign activity will be more than offset by the group obtaining a still larger share in the industrial refrigeration business and by progress in the elevator market. Group profit for the first full year of group operations ended September 30, 1960, was £428,815 (£380,900), after tax of £778,220 (£549,516), and the dividend is raised from 6d. to 6¼d. per 5s. share.

ALREADY OVER 350 FIRMS from 13 countries have arranged to display their products at this year's International Plastics Exhibition—Interplas 61—in London from June 21 to July 1. Visitors to the exhibition will see assembled in the three halls of Olympia, covering an area of 360,000 sq. ft., machinery, materials and products together representing the complete picture of world plastics progress. Attendance at the last show was in excess of 106,000.

Air Flow in Cupolas*

The fines which are invariably present in the coke bed of a foundry cupola detract from operating efficiency by increasing the air-pressure drop through the bed, which means that fan horsepower must be augmented in order to maintain the air flow at its normal value. This article gives suggestions, based on a recent laboratory-scale investigation, for overcoming the trouble without discarding the fines.

An investigation has been made in Australia of how air-pressure drop (in inches water-gauge per foot of bed height) in a bed of coke is affected by coke particle size and shape, air-flow rate, and bed packing.

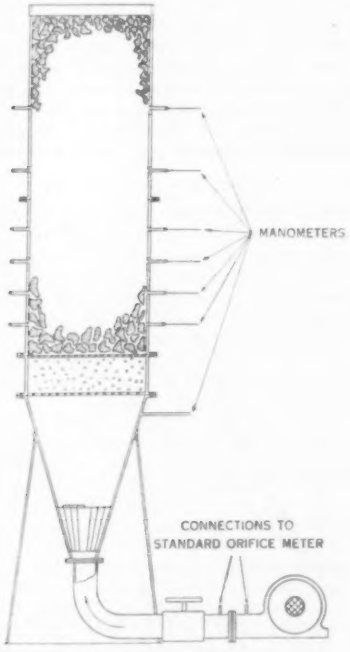
Experimental Details

The measurements were made in a "voidometer," a cross section of which is shown in Fig. 1. It is a cylindrical container of internal dia. 2 ft. and height 5 ft. 6 in., with tappings at various levels which can be connected to water manometers for taking readings of pressure gradient. The measurements covered a range of sizes of coke—from minus ¾ in. plus ½ in. to minus 2 in. plus 1½ in. A hard metallurgical coke was used, which after being crushed was hand-sieved with square-opening sieves and graded into the following four main sizes: minus 2 in. plus 1½ in., minus 1½ in. plus 1 in., minus 1 in. plus ¾ in., and minus ¾ in. plus ½ in. A large sample of each of the four size ranges was selected and the mean weight of a representative particle calculated.

The type of bed packing, as represented by the bulk density (weight of coke divided by total volume of bed), is an important factor in determining the pressure drop through the bed. The voidometer was therefore charged by a variety of methods—dropping from hinged flaps, hand loading from a scoop at different heights, and using a vibrator—to give a range of values of bulk density.

From the results with beds of closely graded coke it proved possible to devise a formula giving the pressure gradient, to an accuracy of 10 per cent., in terms of the rate of air flow through the bed, the mean sieve size and effective diameter of the particles, and the voidage, or fraction of open space, within the bed. Values calculated from this formula are plotted in the graph in Fig. 2. This shows how greatly the size of the particles affects the pressure gradient through the bed; for example, reducing the coke size from minus 6 in plus 5 in., to minus 1½ in. plus 1 in., increased the pressure gradient by a factor of 8.

* The experiments described were carried out under the auspices of the Commonwealth Scientific and Industrial Research Organisation (Australia).



The voidometer.

FIG. 1.—*Diagrammatic cross-section of a "voidometer" showing various positions at which manometers are inserted to register the pressure gradient.*

Mixed Coke Sizes

In Fig. 3 is shown in a two-dimensional way the effects which occur when, instead of beds of closely graded coke, there is a bed of large particles to which a few small particles are added and intimately mixed in. The total volume of the resulting mixture is greater than the original bulk volume of the large particles by an amount which is less than the bulk volume of the added material, because initially some of the small particles can fit into the spaces between the large ones. However, there is a limit to the number of small particles that can be so accommodated and further addition causes the bed volume to increase by approximately the bulk volume of the added material.

Diagram (*a*) represents the theoretical case and (*b*) the type of conditions obtained in practice. In the theoretical case the volume of the bed is unaffected while any of the voids between the large particles remain unfilled (an "unsaturated" bed). At some stage there is no free space left between

Air Flow in Cupolas

the large particles for the small ones (a " saturated " bed) and if more are added they force the large ones apart (a " supersaturated " bed). In practice, however, some of the large particles are forced apart before all the spaces are occupied; this is the arrangement shown in (*b*). The mixing of small coke with large affects two of the variables which determine the air-pressure gradient through the bed, namely the voidage and the effective particle

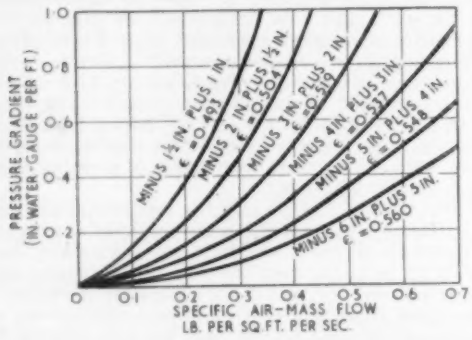


FIG. 2.—*Comparisons of variation of pressure gradient with coke size with uniformly graded coke beds. Values calculated for a temperature of* 15 *deg. C. and atmospheric pressure,* ϵ = *voidage fraction.*

diameter. The latter can be predicted from surface-area considerations. Three series of tests were carried out, in which the following cokes were mixed in various proportions: minus ¾ in. plus ½ in.

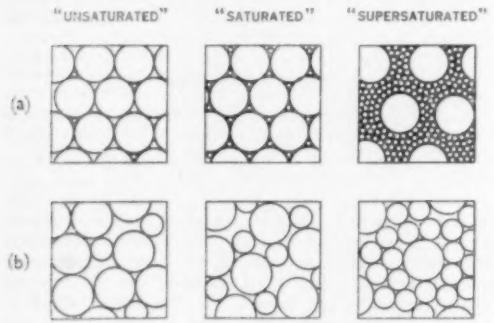


FIG. 3.—*In* (*a*) *is illustrated the theoretical distribution of coke particles in three conditions of packing. A representation is given in* (*b*) *of the corresponding conditions that obtain in practice.*

with minus 1½ in. plus 1 in.; minus ¾ in. plus ½ in. with minus 2 in. plus 1½ in.; and minus ½ in. plus ¼ in. with minus 2 in. plus 1½ in. The experimental

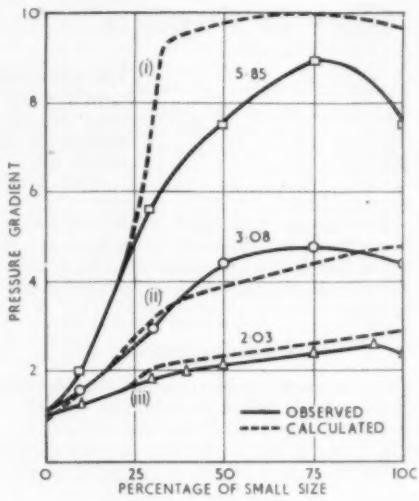


FIG. 4.—*Pressure gradient variation of beds of various large sizes to which increasing quantities of particles of a definite smaller size is added. Permeability of mixed coke beds (numbers on curves are ratios of mean sieve size of large material to mean sieve size of small). (i) Minus* 2 *in. plus* 1½ *in. and minus* ½ *in. plus* ¼ *in., (ii) minus* 2 *in. plus* 1½ *in. and minus* ¼ *in. plus* ½ *in., (iii) minus* 1½ *in. plus* 1 *in. and minus* ¼ *in. plus* ½ *in.*

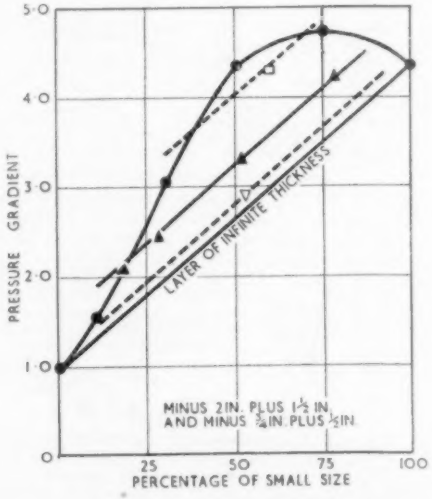


FIG. 5.— *Mixed coke beds: comparison of effects on pressure drop of mixing and layering coke fines.*
Key:— —●—●— *Mixtures.* —□— *6-in. double layer.* —▲—▲— *12-in. double layer.* — —▽— — *18-in. double layer.*

results were compared with values calculated from the theory of mixing. The latter were found to be accurate for proportions of the small-size material of less than 30 per cent.

The graph in Fig. 4 shows how the pressure gradient in a bed of two mixed sizes, relative to that in a bed of the large-size material only, would vary with the percentage of small-size material introduced. If a small amount of fine coke is added many of the small particles fit into the spaces between the large ones, causing a large increase in pressure drop: for example, the pressure drop was doubled by introducing only 10 per cent. of minus ½ in. plus ¼ in. coke into a bed of minus 2 in. plus 1½ in. coke. When the amount of fine material added reached about 33 per cent. by weight most of the available spaces had been occupied, and the increase of pressure drop caused by further additions of fines above this percentage was less pronounced. In some cases the pressure drop was even reduced by further additions of fines.

"Sandwich" System of Charging

Would the deleterious effect of fines be alleviated by charging the two sizes separately instead of mixing them? As the graph (Fig. 5) shows, the answer to this question depends upon the thickness of the layers.

For beds consisting of roughly equal proportions of large and small particles, the layers, whatever their thickness, gave a lower pressure drop than the equivalent mixture. But the saving in pressure drop was insufficient to justify the additional trouble of charging in layers, unless the layer of small particles was at least three particle diameters thick.

Practical Implications

Though the foregoing results refer only to the coke and do not take account of the effect of the metallic charge in a cupola under operating conditions, nevertheless they do give a lead as to the direction in which a solution may be sought to the perennial problem of shortage of fan capacity. The work is to be continued using a working cupola instead of a cold model.

Personal

Mr. V. N. BRAILSFORD has been elected a director of Alfred Herbert, Limited.

Mr. M. C. LLOYD has been appointed a director of N. Hingley & Sons, Limited.

Mr. J. R. PHELPS has been appointed a director of Sterling Foundry Specialties, Limited.

Mr. E. A. MARTIN has been elected to the board of Padley & Venables, Limited, manufacturers of pneumatic tools, Dronfield, Sheffield.

Mr. WALTER GRUNEBAUM has joined Acrow (Engineers), Limited, as an executive director. He is a director of Acrow France S.A.

Mr. G. W. H. RICHARDSON has resigned as a director of Westinghouse Brake & Signal Company, Limited, due to increased business commitments.

Next Mayor of Brighouse (Yorks), will be Cllr. SAMSON WILLIAMS, an employee at the engineering works of J. Blakeborough & Sons, Limited.

Sir JOHN WRIGHTSON, chairman and managing director of Head Wrightson & Company, Limited, has been appointed a Deputy Lieutenant for County Durham.

Major F. D. OUTRIDGE has been appointed assistant to Captain R. A. VILLIERS, director of the Scientific Instrument Manufacturers' Association, 20, Queen Anne Street, London, W.1.

Mr. RONALD L. BASSET has been appointed a director of Associated Electrical Industries, Limited. Following this appointment he has resigned from the board of Associated Electrical Industries (Woolwich), Limited.

Mr. H. F. SPENCER, managing director of Richard Thomas & Baldwins, Limited, has accepted appointment as president of the British Iron and Steel Research Association. He succeeds the late Sir CHARLES BRUCE-GARDNER.

Mr. ERIC WOOD has been appointed home sales manager of Robert Hudson, Limited, iron and steel founders, etc., Leeds. Mr. Wood was formerly sales consultant to a group of companies within the Rank organisation.

Mr. A. E. THORNTON, of Firth Vickers Stainless Steels, Limited, has been nominated by the British Iron and Steel Federation to serve on the regional committee for the East and West Ridings of the Industrial Training Council.

Sir LESLIE GAMAGE, who recently retired as chairman of the General Electric Company, Limited, continues to act as chairman of Pirelli-General Cable Works, Limited. Mr. R. H. PHILLIPS has been appointed a director of the latter company.

Mr. P. LAMBERT has been appointed head of the engineering section of the British Steel Castings Research Association. Mr. Lambert, who joined the Association's staff in 1955, has recently been engaged on liaison work with member-firms relating to work simplification.

Mr. E. C. GILL, president of the Canada Life Assurance Company, Limited, has been elected a member of the advisory committee of the International Nickel Company of Canada, Limited. He has also become one of the trustees of the company's retirement system fund.

Mr. J. W. BUTLER has been elected chairman of Associated British Machine Tool Makers, Limited, in place of Sir GREVILLE S. MAGINNESS, who has resigned. Mr. E. WILLIAMS has been elected deputy chairman. Mr. EDWARD PARKINSON has resigned from the board for private reasons.

Mr. JOHN ARTHUR CROFT, deputy chairman and managing director of Crofts Engineers (Holdings), Limited, Thornbury, Bradford 3, has been appointed chairman of that company and its principal operating subsidiary companies, including Crofts (Engineers), Limited, and Carter Gears, Limited.

Twenty-year-old Mr. GERALD RAMSHAW is the first member of the staff at the Metals Division of Imperial Chemical Industries, Limited, Witton, Birmingham, to receive the Fleck Award. The award is to be made annually from money donated by Sir Alexander Fleck when he retired last year as chairman of ICI.

Mr. L. J. BROWN and Mr. H. D. WALKER have joined the board of Johnson & Phillips, Limited. Mr Brown is a director of Electric & Musical Industries, Limited, and was for some years managing director. Mr. Walker is a director of Constructors John Brown, Limited, and its subsidiaries and other companies.

Law Cases

Lack of Maintenance blamed

A 39-year-old Derby man, who was struck on the arm by a bogie at a Derby foundry, stated at Derby Assizes that he could not play the piano, put up wall-paper or dig his garden. He was awarded £1,097 damages by Mr. Justice Streatfeild claimed against his former employers. The man, Mr. E. A. Foss, was working near a furnace when a 3-cwt. bogie supporting the ladle gave way and struck his arm; the metal missed him. Mr. Howard Sabin, for Mr. Foss, said "He sustained fairly serious injuries and had a fortunate escape." The factory foreman, Mr. J. W. Berry, said that the bogie system was attached to an overhead monorail which operated the ladle; the points on the monorail could be set for the bogie to travel on one of two tracks. When he heard the ladle fall he noticed the points were half open. In his opinion Foss brought the bogie forward too quickly which caused it to strike a stop plate which bent and bounced back. He said it was Foss's job to check the points. Mr. Justice Streatfeild said, "I think the plate became bent over a course of time and because it was bent the accident happened. I do not think Mr. Foss used any excessive force." In his opinion the device was not properly maintained.

Decision on Carron Company Charter

By a majority of two to one, the First Division of the Court of Session have upheld a decision of Lord Walker dismissing as irrelevant an action brought against Carron Company, ironfounders, Falkirk, by an Edinburgh woman who claimed that she was entitled to a vote in the direction and management of the company's affairs. The action was brought by Mrs. Dorothy Barron Pentland Forwell or Brown, 19, Campbell Road, Edinburgh, widow of Charles Marshall Brown, who, at the time of his death in 1948, was secretary of the company and a voting partner. In terms of his will, Mrs. Brown inherited his whole estate, including his 17 shares, each valued at £250, in the Carron Company, her shareholding thus becoming the largest held by anyone in the company as an individual.

Mrs. Brown sought declaration that she is a partner —entitled to vote in the direction and management of the company's affairs; and reduction of a decision by the company to petition the Privy Council for a supplementary charter amending the Royal charter granted to them in 1773. Mrs. Brown sought to have the petition withdrawn, maintaining that she had not been consulted on the matter nor given an opportunity to vote on it.

Conveyor-belt should have been stopped

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Law Cases

Lack of Maintenance blamed

A 39-year-old Derby man, who was struck on the arm by a bogie at a Derby foundry, stated at Derby Assizes that he could not play the piano, put up wall-paper or dig his garden. He was awarded £1,097 damages by Mr. Justice Streatfeild claimed against his former employers. The man, Mr. E. A. Foss, was working near a furnace when a 3-cwt. bogie supporting the ladle gave way and struck his arm; the metal missed him. Mr. Howard Sabin, for Mr. Foss, said "He sustained fairly serious injuries and had a fortunate escape." The factory foreman, Mr. J. W. Berry, said that the bogie system was attached to an overhead monorail which operated the ladle; the points on the monorail could be set for the bogie to travel on one of two tracks. When he heard the ladle fall he noticed the points were half open. In his opinion Foss brought the bogie forward too quickly which caused it to strike a stop plate which bent and bounced back. He said it was Foss's job to check the points. Mr. Justice Streatfeild said, "I think the plate became bent over a course of time and because it was bent the accident happened. I do not think Mr. Foss used any excessive force." In his opinion the device was not properly maintained.

Decision on Carron Company Charter

By a majority of two to one, the First Division of the Court of Session have upheld a decision of Lord Walker dismissing as irrelevant an action brought against Carron Company, ironfounders, Falkirk, by an Edinburgh woman who claimed that she was entitled to a vote in the direction and management of the company's affairs. The action was brought by Mrs. Dorothy Barron Pentland Forwell or Brown, 19, Campbell Road, Edinburgh, widow of Charles Marshall Brown, who, at the time of his death in 1948, was secretary of the company and a voting partner. In terms of his will, Mrs. Brown inherited his whole estate, including his 17 shares, each valued at £250, in the Carron Company, her shareholding thus becoming the largest held by anyone in the company as an individual.

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mechanized 'slinger unit. Mr. Pinchin claimed experience only on hand-operated 'slingers which could be operated superbly by well-trained men. "Joy-stick"-operated machines, he believed, might also be controlled equally well, but hand operation gave more versatility. To avoid operator fatigue, he favoured the principle of on-hour's 'slinging, followed by one hour doing less onerous and exacting work, for each operator.

Proposing the vote of thanks, Dr. Sully said he had no practical experience of iron-founding and the lecture had been of great interest. 'Slingers in the steel foundry were used mainly for throwing in backing sand but in the hands of experienced men, they certainly seemed to provide a means in the iron foundry for making the whole mould. He thanked the lecturer for this practical and instructive paper. Mr. R. Wright echoed Dr. Sully's sentiments and said he had also been very interested in the aspects of sand cooling and batch milling. The vote was passed by acclamation.

Stoke-on-Trent Section

There was a capacity attendance of 250 members and guests at the annual dinner/dance of the Stoke-on-Trent section held at the Grand Hotel, Hanley. In an extremely witty speech, Mr. G. R. Shotton, F.I.M., national president, proposed the toast to the Institute and paid tribute to the progress being made by the section under the presidency of Mr. J. F. Dowell. Mr. Dowell, in reply, took the opportunity of expressing his appreciation of the support he had received from the hon. secretary of the section and also from the Council. The toast to "Our Guests and the Ladies" was proposed by the section vice-president, Mr. B. Cordall, and the Lord Mayor of Stoke-on-Trent, who responded, stressed the efforts being made by the various industries to compete in world markets. He welcomed the work of the Institute in the district in furthering technical knowledge of the foundry industry. Other civic guests present were the Mayor and Mayoress of Newcastle-under-Lyme. During the evening presentations of Doulton figures were made to Mrs. Dowell and Mrs. Shotton. Dancing after the dinner was to the music of the Grand Hotel Orchestra with Mr. G. H. Charsley, past-president, and Mr. H. Stubbs acting as masters of ceremonies.

Northampton Section

The director of the British Cast Iron Research Association, Mr. H. Morrogh, addressed the Northampton section meeting in January at the Plough Hotel, Northampton. His subject, the work of the BCIRA, made a most entertaining lecture when delivered by such an able speaker. Mr. Morrogh spoke of the origins of the Association, its organization, membership system, etc., and finally dealt with facilities which existed at Bordesley Hall, Alvechurch, the present headquarters of the Association.

Following this general introduction, Mr. Morrogh illustrated the experimental work of the Association with a few examples of recent activities. These included an investigation concerned with the prevention and control of shrinkage porosity and similar unsoundness in iron castings. In this respect, said Mr. Morrogh, the Association had been able to show the overwhelming importance of the mould itself—its rigidity and hardness. He strongly recommended that observations be made on casting dimensions and casting weight when problems of unsoundness were being experienced. Also in this connection, Mr. Morrogh described how a technique for recording the quality of molten metal had been developed according to the degree of nucleation of the melt. Another investigation concerned the origin of pinhole and blowhole defects in iron castings. Pinhole defects, which usually occurred just below the cast surface, had been shown to be due to hydrogen picked up from the mould, and this could be aggravated by the presence of traces of aluminium in the molten metal. It was thought this aluminium generally entered the metal by way of scrap. In almost every reported case, relief from pinholing was obtained when aluminium was carefully eliminated from the furnace charges.

As to blowholes arising from the entrapment of slag, Mr. Morrogh indicated that when manganese and sulphur contents were relatively high, manganese sulphide tended to segregate to the surface, causing the ladle slags to assume a fluid character which made it difficult to prevent them from entering the mould. When the ladle slags were entrapped in the casting there was a reaction shortly before and during solidification which caused gas evolution, giving rise to the blowholes.

Discussion

The lecture aroused considerable interest, and at question time Mr. Morrogh was kept very busy answering numerous questions. Asked about non-destructive testing of castings and the most effective method of locating sub-surface defects, he said that Gamma-ray, X-ray, and ultrasonic testing could be used—the actual technique depending upon the nature of the defect and the size of the casting. To another question Mr. Morrogh replied that in certain circumstances runner design could be critical with regard to porosity, although certain designs of castings could be run with a variety of methods without observable difference; here the Association had accumulated considerable data. Concerning surface finish, inquiries referred to BCIRA would be dealt with from the point of view of mould materials and mould coatings. Considerable research on fluidity had indicated that metal temperature had far greater influence on fluidity than the variations in composition likely to be experienced in normal practice. Other questions elicited the information that the Association was constantly trying to improve methods for determining trace-elements, but due to the very nature of such "impurities" the methods were lengthy and beyond the scope of many routine laboratories. A constant survey was made of the trace-element content of foundry pig-irons. With regard to the chill test, with present knowledge and data available, it could be more intelligently interpreted than formerly and he thought would become more widely used.

At this point the president, Mr. R. Jelley, had to curtail the questions, and a very warm vote of thanks was proposed to Mr. Morrogh by Mr. L. W. Bolton, seconded by Mr. W. J. Wood.

West Riding of Yorkshire

A works visit to J. J. Dyson, Limited, Griffs Works, Stannington, near Sheffield, has been arranged for the West Riding of Yorkshire branch on March 18. It is scheduled to start at the works at 10 a.m. prompt and should terminate at approximately 12 noon. If necessary, arrangements will be made for coach transport from Leeds at 7.30 a.m. picking up members at Bradford, Halifax and Huddersfield. Those wishing to participate should make application to branch honorary secretary, Mr. F. Sutcliffe, 109, Highroad Well Lane, Highroad Well, Halifax, not later than March 13.

Correspondence

To the Editor of the FOUNDRY TRADE JOURNAL

RESEARCH AND GREY-IRON CASTINGS

SIR,—In the issue of January 26 the JOURNAL gave some extracts from an address under the above title by Mr. H. W. Lownie, of Battelle, fully recorded in *Grey Iron News* for December, 1960. A news item in an earlier issue had mentioned his statement that the United Kingdom on a comparable basis had "a research effort about seven times ours." Since the total output of iron castings in the two countries has an approximate relation to total population, and the ratio of the respective populations is of the order of 3.3:1, this would mean that the United Kingdom is spending at least twice as much on ironfoundry research as the United States.

While the United Kingdom may well feel flattered by the comparison, and wish success to Mr. Lownie's efforts to promote such research in the US, his figures cannot be accepted without reserve. Equally difficult to accept in its entirety is the implication that the maintenance of a relatively stable British output over the past 10 years for "miscellaneous castings" is as a consequence no coincidence, while US shipments for such castings have shown a marked decline over the same period.

To understand what is covered by "miscellaneous castings" one has to refer to the lecture by Mr. W. J. Grede, published in *Modern Castings*, for June, 1960. From the total US production of grey-iron castings, he takes away the output of ingot moulds, chilled car-wheels, pressure-pipes and fittings, and soil-pipes and fittings. The balance—two thirds of the total—is called "miscellaneous castings" and is divided into two roughly equal parts as castings "made for sale" and "for own use." The whole weight of the statistical conclusions rests upon that third of the output "made for sale" although the percentage of turnover spent on research is based on the whole industry.

Categories

Doubtless iron castings "made for sale" are of major interest to the trade association Mr. Lownie addressed, and the distinction in the United Kingdom between jobbing and specialized foundries on the one hand, and captive or attached foundries on the other, is well understood. The official statistics for the industry in the United Kingdom, however, for good reasons do not distinguish between "own use" and "made for sale" categories. For the purposes the author has in view there would appear to be little point in using the distinction in his argument, which is weakened by the fact that—on the figures disclosed—while in the decade to 1957, iron castings in US "made for sale" show a fall (as indeed do steel castings and malleable-iron castings), total iron castings production shows a rise, although admittedly not proportionate to the increase in population.

The only figures recording expenditure on ironfounding research and development in the United Kingdom are contained in a report from the Department of Scientific and Industrial Research, issued in 1958, and based on an enquiry using figures for 1955. It is important to note the inclusion of technical development, because Mr. Lownie refers throughout to research, implying experimental research, and does not mention development, which is usually at least as costly, and in many cases more so. The British figure thus includes all research, basic and applied, and technical development and service work leading to change in materials and methods or to improvement of existing materials, methods, processes and equipment. It excludes all work of a scientific character involved in routine control or for other purposes in production. The report mentioned gives total research and development expenditure for ironfounding in 1955 as £788,000, of which £590,000 was spent by the industry internally, and £198,000 externally, that is mainly through the Research Association, this being about one-fourth of the total. Taking this total as roughly £0.8 million, on Mr. Lownie's basis, American expenditure would be £0.4 million, which is in the neighbourhood of the million dollars quoted by him. It is not clear whether this figure includes or excludes the half million dollars listed as expended by trade associations and other groups in the field of grey and malleable cast iron as distinct from the industry itself. Quite apart from the point about development expenditure, it is difficult to believe that these figures are not exceeded alone by a few of the large firms concerned in the US ironfounding industry, such as Westinghouse and G.E.C., Ford, General Motors, International Nickel, Union Carbide, American Brake Shoe, International Harvester, and so on. On a comparable basis American figures would show a very different picture, and the writer is thus forced to reject Mr. Lownie's conclusion.

By comparison with other manufacturing industries, the British figure for ironfoundry research is by no means high, being given in the report mentioned as 0.4 per cent. of turnover or 0.8 per cent. of the net output, which represents the value added by the industry to the materials employed. Other evidence suggests that these figures are on the high side, but excluding the aircraft industry as a special case, the average expenditure of British manufacturing industry in general is two per cent. of its net output. The same conclusion is reached if the research and development expenditure per person employed be considered.

The United Kingdom has too good a reason to be proud of its research record to wish to avoid prejudicing assessment by overclaiming. Mr. Lownie lists a number of foundry developments in the last 10 years as originating outside US, "in countries where it is recognized that foundry research is necessary for growth," but by no means all of these can be credited to systematic research. One may well agree with Mr. Lownie that the situation in US shows disturbing features, but a deeper analysis of causes and possible remedies seems to be needed. Yours, etc.,

J. G. PEARCE.

Harborne, Birmingham.

FOUNDRY CRAFT TRAINING CENTRE

SIR,—In your report of the annual dinner of the Foundry Trades' Equipment and Supplies Association in the March 2 issue of the JOURNAL, you mention my references to the National Foundry Craft Training Centre. Apart from stressing the general value of the Centre, I spoke of the appeal to the industry for a re-building fund which has now realized over £23,000. The trustees of the Centre require, however, over £50,000 to cover the full building costs and have therefore as a first stage authorized only the erection of the training foundry. By itself this will already be a vast improvement on the existing one, including not only an excellent training shop but also a lecture room. Part of the ground will, however, be left vacant until further subscriptions to the appeal permit the building of the hostel which is planned.

I am anxious that the impression which might have been created by your account should not mislead those who have not contributed or those who might consider further donations.—Yours, etc.,

N. P. NEWMAN, *Chairman, Joint Iron Council*

American Letter

AFS Michigan Regional Conference

More than 400 attended the Michigan Regional Conference of the American Foundrymen's Society at the end of last year, in the Hotel Bancroft, Saginaw, Michigan, USA. A wide variety of subjects was covered in the papers presented and random extracts from the report of the proceedings included the following.

In his paper on pressure- and gravity-die-casting processes, Mr. L. G. Axford (of Ford Motor Company, Dearborn, Michigan), said that the advantages of pressure-die-casting included rapid production in long runs, production of complex shapes, close dimensional tolerances, easy coring, smooth surfaces and thin sections. The disadvantages listed were higher cost of the die, large capital investment, tendency towards casting porosity, limits on production of certain shapes and inability to use sand cores. Turning to the gravity-die process, he said the advantages of this were economy of short-run production, inexpensive tooling, superior structure in heavy sections, wider range of weight and dimensions, ability to obtain maximum mechanical properties, use of a wide range of alloy compositions and heat-treatment. Disadvantages were inferior surface-finish, greater machining tolerance and lower yield.

Mr. S. L. Strong (General Motors Corporation, Flint, Michigan) presented a step-by-step description of magnesium pressure-die-casting at his company's AC spark-plug division. He said that his firm operated eight cold-chamber die-casting machines in capacities ranging from 100 to 2,000 ton locking-pressure and the largest casting being produced was an instrument console for the Chevrolet car which weighed about 4½ lb.

A description was given on the production of spheroidal-graphite iron castings by Mr. W. D. McMillan (of Ohio Ferro-Alloys Corporation, Chicago) in the course of which the lecturer stated that the most profitable application of this material was for equipment designed to take advantage of its mechanical properties. S.-g. iron castings, he said, were being used in place of intricate forgings, but were less competitive with simple forgings.

Cores, Control and CO_2

In another paper, Mr. T. B. Pfaff (of the Pontiac motor-car division, General Motors Corporation) described present developments in suitable furfural alcohol resin-bonded cores. He said that cores could be adjusted over a wide range so that they could be used with light alloys as well as with ferrous and copper-base alloys. Smaller cores must be made solid, but in sections up to about 1 in., they cured in a matter of seconds. In heavy sections, a sufficiently thick skin was developed in the hot box to permit the core to be removed, and curing of the interior could then be obtained by a short oven-treatment.

A further technical contribution described how sand could be handled in an automated system using various types of instruments to control the processing of the sand and this was presented by Mr. Randolph Dietert of Harry W. Dietert Company, Detroit.

Mr. J. W. Nuss (American Radiator and Standard Sanitary Corporation, Louisville, Kentucky) and Mr. Eric Welander (John Deere Malleable Works, Illinois) discussed planning and arrangement of equipment for the efficient and economical operation of two new foundries, and gave the results obtained when the foundries were in operation.

Mr. H. Gravlin (United Aircraft Corporation, Connecticut) reported that sound castings for aircraft were essential and not too difficult to produce by experienced, technically competent founders. Surface appearance was quite important and he said that aircraft firms were willing to pay good prices for castings which met their requirements.

The final paper at the Conference was given by Mr. R. Fisher (Oliver Machinery Company, Foundry Division, Grand Rapids, Michigan) and Mr. T. Barlow (International Minerals and Chemical Corporation, Illinois) and described the CO_2 Process. In his contribution, Mr. Fisher said that in general 1 lb. CO_2 was sufficient to harden 100 to 250 lb. of silicate-bonded sand, depending on the thickness of the core and the amount of silicate used, and the pressure used might range from 15 to 40 lb. per sq. in. Among his other points, he stated that treated cellulose additions to the sand aided collapsibility; when cores were coated with washes to give smoother surfaces, it was preferable to use those compounded with an alcohol carrier, and where water-soluble binders were used, the core must be dried in an oven before use. Talking of CO_2 moulding sands, Mr. Barlow indicated that the use of 2 per cent. clay and coarser sands permitted better ramming. Since clay tended to absorb moisture, the moisture content of the moulding sand should be increased 0.5 to 0.75 per cent. prior to the addition of the silicate binder. In larger moulds, he said that use of CO_2-type sand as a facing backed up with regular greensand reduced moulding costs and gave good results.

"Round-table" Discussions

Following presentation of the papers, round-table discussions were held covering widely-differing subjects with group chairmen as follow: Spheroidal-graphite iron—H. E. Henderson (of Lynchburg Foundry Company, Lynchburg, Virginia); malleable iron—E. F. Chojnowski (of Albion Malleable Iron Company, Michigan); cupolas—Howard H. Wilder (Vanadium Corporation Company of America, Chicago); shell-moulding—W. Bopp (Midwest Foundry Company, Coldwater, Michigan); dies, moulds and patterns—R. Requat (of Dow Chemical Company, Bay City, Michigan); ferrous casting—M. Warchol (Atlas Foundry Company, Detroit); pressure-die-casting—R. Carrol (General Motors Corporation, Flint, Michigan); gravity-die-casting—George R. Frye (Eaton Manufacturing Company, Vassar, Michigan), and foundry sands—T. W. Seaton (of American Silica Sand Company, Ottawa, Illinois).

Developments in Magnesium Castings

Dow Chemical, principal producer of magnesium ingot and a volume producer of magnesium castings, has disposed of its casting business by sale to the Wallman Company, for the purpose of eliminating its dual role of ingot supplier and castings supplier to industry. Dow will concentrate upon its ingot production and will continue its research and development work for casting applications and maintain its promotion of magnesium castings. A customer service laboratory is soon to be opened by Dow, an addition to the company's programme of technical assistance.

A greatly-expanded use of magnesium by the automobile industry in the US within the next three years has been forecast, and the magnesium industry expects that by 1965 the use per unit of car production will exceed 10 lb. Large transmission parts are expected to offer the greatest current potential for increased use of magnesium. The successful use of magnesium in the crankcase and transmission of the Volkswagen

indicates that this metal will perform successfully in corresponding parts of American cars. Automobile transmissions are now largely made of aluminium castings and, on an industry-wide basis, average out at about 18 lb. per passenger vehicle produced.

At 10 lb. of magnesium per car, the six million annual car market in the US would require over 26,800 tons annually—more than double the present output. Of 49,000 tons produced in 1960, about 20 per cent. is expected to emerge in the form of foundry products as sand, gravity- or pressure-die-castings—50 per cent. as sand castings, 15 per cent. as die-castings, 30 per cent. as anode castings and 5 per cent. miscellaneous. A last large increase in the use of magnesium in the US occurred about 1955 when the anode* market was developed.

*Cast anodes for protecting ships, pipelines, etc., against galvanic corrosion.

News from South Africa

Diesel-engine Factory in Production

South Africa's first diesel-engine factory at Meyerton, near Vereeniging, is exporting engines to the Federation of Rhodesia and Nyasaland only seven months after reaching the production stage. Capt. D. M. K. Marendaz, a former works manager of a British car factory, began building the Meyerton plant on a 50-acre site on the Klip River in September, 1959. The first diesel engine made in the Union was produced there last June. Last month the plant despatched five diesel engines—a repeat order—to a big engineering firm in Salisbury. Last September, a two-cylinder Marendaz diesel-engine was displayed at the South African pavilion at the Salisbury Show; since then there has been a regular flow of orders from the Federation to the Meyerton plant, it is stated.

Mechanized Ore-loading Port: The plan to make Port Elizabeth (Algoa Bay) a fully-mechanized ore-loading port has been carried a major step forward with the placing of an order to the value of £721,947 for special ore-loading plant. The new plant, expected to be in working order towards the middle of 1963, is designed to off-load trucks and place the ore in a stock pile at the rate of 1,500 tons per hr. For this purpose two dumpers or tipplers will be provided with a handling rate of 750 tons per hr. each.

From the dumpers the ore will be conveyed by belts to the stock-pile area where there will be storage space for about 184,000 tons of ore. Conveyor belts will be provided from the stock-pile area to convey the ore to an elevated gallery 600-ft. long parallel to the quay covering one berth. To bridge the gap between gallery and ship two ships loaders, each able to handle ore at a rate of 750 tons per hr., will be provided.

ISCOR'S BOARD OF DIRECTORS is to award £5,000 to the University of Pretoria each year for the next ten years for the training of metallurgists, according to a statement by Dr. C. M. Kruger, general manager of Iscor, South Africa's iron and steel corporation. As a result the University will this year institute a three-year B.Sc. honours course with metallurgy as a major subject, a post-graduate B.Sc. honours course, and a four-year B.Sc. course in metallurgical engineering.

POWELL DUFFRYN, LIMITED—Mr. G. A. H. Jones, managing director of Stephenson Clarke, Limited, and Mr. S. J. L. Hill, managing director of Cory Bros. & Company, Limited, have been elected to the board.

Eye-Protection Film

Although H.M. Chief Inspector of Factories' Report for 1959 lists nearly 7,000 eye-injuries of different types and degrees of severity, eye injuries are not one of the major hazards of the steelfounding industry. However, in view of the seriousness of possible consequences of even apparently trivial eye-injuries, the Safety Committee of the British Steel Founders' Association has for some time now been conducting a campaign to reduce accidents to eyes. This campaign has been supported in steel foundries by posters and pamphlets for operatives and the Committee has now produced a film emphasizing the need for the continuous use of goggles, eye-shields, etc., the importance of obtaining skilled treatment for any eye injury and the possible consequences of neglecting these precautions. The film, entitled "Your Eyes are Precious," is a 16-mm sound-and-colour film running for approximately eight minutes and deals particularly with situations which may arise in steel foundries. Its general theme, however, is one which the BSFA Safety Committee feels can be applied to any industry and they have therefore arranged for copies to be available on loan to any interested organization on request to the Association at Broomgrove Lodge, 13, Broomgrove Road, Sheffield 10.

Copies of the film may also be purchased through BSFA at a cost of £15 per copy as it is thought that many firms or overseas organizations may wish to show the film to successive classes of apprentices or in different departments of their works.

Firm's Co-operation Praised

Fumes emitted from a furnace owned by East Kent Ironworks in Frederick Street, Sittingbourne, Kent, have caused complaints to be made to the Urban Council. At a recent enquiry, it was stated that investigations had shown that the cupola was used once a week for about four hours. Fumes with a high-sulphur content were occasionally emitted from the furnace, and sometimes there were fumes from two exhaust fans. The fans had been installed at the request of the Inspector, but under certain wind conditions, it was stated that fumes still descended into gardens of nearby-houses. The Chief Public Health Inspector said the firm had been most co-operative in trying to reduce the nuisance, and he was satisfied that the furnace was being operated in accordance with the best practical means. The only solution would be to remove the cupola furnace to some remote site from the dwellings involving the removal of the whole works. In his opinion there was a need for a part of the town to be set aside for some types of industry.

Legislation for Industrial Injuries

The law relating to the Industrial Injuries Scheme is covered in a recent Ministry of Pensions and National Insurance publication. The work which shows the principal Acts and Regulations, contains lists of statutory instruments, grouped both numerically and according to subject matter, and tables showing change of rate of benefits and contributions. It is a loose-leaf volume and a first supplement, published at the same time, brings the subject matter up to date as at December 1, 1960. The volume, the first of three of the Ministry's "Consolidated Version of Acts and Regulations" is obtainable from H.M. Stationery Office, or through any bookseller, price £2 5s. (by post £2 7s.), and the first supplement costs 2s. 4d., post free.

News in Brief

THIS YEAR the *Association Technique de Fonderie* (French Foundryman's Association) will celebrate its golden jubilee.

AUDLEY ENGINEERING COMPANY, LIMITED, Newport Shropshire, has changed its name to Audio, Limited, with effect from the beginning of this month.

RANSOMES, SIMS & JEFFERIES, LIMITED, Ipswich, are to supply a 25-cwt. battery crane for use at the Bradford Valley goods depot of the North Eastern Region of British Railways.

PLATT BROTHERS (SALES), LIMITED, a subsidiary of Stone-Platt Industries, Limited, have secured a contract for the supply of textile machinery for Poland worth approximately £350,000.

A COMPLETE CARILLON of 66 bells has been ordered by the Municipality of Springfield, Ill., USA, from the Bell Foundry Petit en Fritsen of Aarle Rixtel, Holland. Total weight of the carillon will be 40 tons.

A CUPOLA MADE by student apprentices at the Sheffield firm of Newton Chambers & Company, Limited, has been installed in the foundry practice shop in the new extension building of Rotherham Technical College.

PHILIPS ELECTRICAL, LIMITED, plan to enter the United Kingdom market in major domestic appliances in 1962. A new group within the company to handle such products is already being formed under the commercial management of Mr. H. W. Thompson.

THIRTEEN MEN and four women who have a combined working record of more than 550 years received long-service awards from their employers Griffin & George, Limited, scientific laboratory-equipment makers, of Birmingham, at a dinner held at Smethwick.

A PARTY OF PERUVIAN TECHNICIANS, 13 in number, recently toured the works of Fairbairn Lawson Combe Barbour, Limited, Wellington Foundry, Leeds. Sir John Lawson, a director, welcoming the visitors, said the firm had made the swords used in the Battle of Waterloo.

INCREASES IN the rates of drawback of import duty on imported linseed oil used in the manufacture of specified exported goods (including printers' inks) are among the provisions made in the Import Duty Drawback (No. 2 Order), 1961, which came into operation on March 1.

ADREMA (HOLDINGS), LIMITED, Telford Way, London, W.3, specialists in data-writing systems, has reached agreement with Siemens & Halske Aktiengesellschaft, Munich, to market the Productograph. It will be assembled in the United Kingdom into systems to customer requirements.

ALBRIGHT & WILSON (MFG), LIMITED, Knightsbridge Green, London, S.W.1, announces an agreement has been made with Hanson-Van Winkle-Munning of Matawan, New Jersey, USA, which will enable the British company to greatly extend the range of plant which it provides for operation of metal finishing processes.

P.G. ENGINEERING, LIMITED, an associate of Power Gas Corporation, Limited, of the Davy Ashmore group, is to build the cyclic catalytic oil gas plant for Alliance and Dublin Consumers Gas Company, Limited. The plant will consist of two units of the Segas process, producing town gas from heavy oil. The contract is due for completion by August 1962.

WHILE WATCHING the top of a nuclear reactor being cast at a foundry at Vasteraas, Sweden, Sir John Coulson, the British Ambassador, and his wife, had to run to safety when a ton of molten iron fell from a truck and ran on to the floor round the platform from which they were watching.

MECHANICAL EQUIPMENT for the new continuous-casting-plant of K-M Steel Products, Limited, Richmond, N.S.W., Australia, is to be supplied by Distington Engineering Company, Limited, of Workington, through their associate Concast A.G. of Zurich. The order is for a twin-strand unit, designed to cast 2-in. and 3-in. square steel billets and 8-in. by 4½-in. slabs.

THOMAS GREEN & SON, LIMITED, engineers, Leeds, have secured an order for 20 road rollers for the Highways Department of the Government of the Union of Burma. With a major contract for the supply of rollers to a company in this country, the work is worth £150,000. Mr. G. C. Kime, the firm's sales manager, is at present touring Pakistan, Burma, Malaya and Iran.

THE INSTITUTION OF WORKS MANAGERS is to hold its first international conference at Linden Hall Hotel, Bournemouth, from April 21 to 23. The theme will be the "Role of Management in Industrial Relations," and the lecturers will come from this country, Sweden, America and Switzerland. Details of the conference can be obtained from the secretary, Mr. George J. West, 196, Shaftesbury Avenue, London, W.C.2.

AN ORDER FROM MOSCOW for a carbon-black recovery plant worth £500,000 has been secured by Tilghman, Limited, of Altrincham, Cheshire, a member of the Staveley Coal and Iron group. The company has had orders for two similar plants from Paris and Milan. Tilghman's is developing its dust and fume division and is now producing plant which until two years ago was mainly supplied from the United States.

THE METALLURGICAL SOCIETY of the American Institute of Mining Engineers announces the holding of the 44th conference at the Sheraton Hotel, Philadelphia, from April 10 to 12, of the National Open Hearth Steel Committee and the Blast Furnace, Coke Oven, and Raw Materials Committee of the Iron and Steel Division. The technical programme will consist of approximately 80 papers. Details are available from the Society at 29, West 39th Street, New York 18, N.Y., USA.

A PROPOSAL is to be shortly laid before Parliament seeking approval to increase next year's vote provision for trade fairs, trade weeks, etc., by some £200,000 to a total of £530,000. The extra money will be used to encourage, in co-operation with trade associations, more firms to take part in overseas trade fairs, particularly specialised fairs; to improve the adequacy of British representation in major international trade events; and to give more support to British Weeks and other special promotions overseas.

ALL SECTIONS of the Australian motor industry are combining to make a survey of the effects of the Federal Government's economic restrictions on the industry. The result of the survey will be submitted to the Government. More groups of Australian automobile workers have been laid off in Victoria, New South Wales and Tasmania. Over 5,000 car workers have now been dismissed since the Federal Government increased the sales tax on motor vehicles and in general tightened credit last November.

NORTH DERBYSHIRE ENGINEERING COMPANY, LIMITED, Darley Dale, have completed the prototype of a 60 m.p.h. trailer, the "Norde," for express haulage on

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the new motorways. It has an eight-speed gearbox. The "Norde," designed and created by Mr. Ronald Wragg, chief engineer and a director of the company, was evolved to meet the requirements of Toft Bros. and Tomlinson (1954), the company's associated haulage concern. It will eventually be offered on the open market, and will be manufactured at Darley Dale.

THE BRITISH OCCUPATIONAL HYGIENE SOCIETY has arranged a conference to consider the need for hygienists within industry in the United Kingdom and the type of training facilities which can be provided. The conference will be held at Birkbeck College, Malet Street, London, W.C.1, on April 11. Non-members of the Society will be welcome. Application for registration should be made to Mr. J. Steel, Department of Industrial Health, Medical School, King's College, Newcastle-upon-Tyne. The registration fee is one guinea.

NEW ZEALAND DEPUTY PRIME MINISTER, Mr. J. Marshall, stated in Melbourne recently, that New Zealand is expected to increase its imports of cars soon and Australia is certain to get its share in the market. There is a shortage of cars in New Zealand following import controls. Under a new tariff arrangement, to be introduced in New Zealand, there will be an adjustment of the method of valuing Australian goods for purposes of duty; at present Australian goods are charged as if the Australian pound was equal in value to the New Zealand pound.

FOR THE FIRST TIME in Britain, in January of this year a helicopter was used for laying steel pipe. Half a mile of 8-in. nominal bore steel-pipe made up of 100 flange lengths each 20-ft. long, and weighing 4 cwt., was laid across Cliff Marshes near Gravesend by a British United Airways Widgeon helicopter. The job, which by normal methods, might take anything from ten to 14 days was completed in under eight hours flying time at a saving of over 50 per cent. in cost. The helicopter was fitted with slings which had been specially designed by G. Hunter (London), Limited.

THE CENTRAL COUNCIL OF PHYSICAL RECREATION, 6, Bedford Square, London, W.C.1, is organizing an expedition to the French Alps this Easter for boys between 15 and 18 years of age (either at school or at work). The party will visit Lanslevillard from March 25 to April 7, and the all-in cost of £27 will include five hours' ski instruction daily, full use of equipment, travel, board and accommodation in a ski chalet. The French Ministry of Education and the Ski Club of Great Britain are co-operating in the venture. Applicants should obtain a recommendation from their schoolmaster or employer.

BAKER PERKINS, LIMITED, Peterborough, and Molins Machine Company, Limited, London, have announced that an arrangement has been agreed by the two companies to work together in Brazil. The approval of the Bank of England and H.M. Treasury has been granted for the existing Baker Perkins factory in Sao Paulo to be doubled in size and for Molins to acquire a 50 per cent. interest in the capital by providing machine-tools and cash to the value of £125,000 approximately. The Brazilian company will in future operate under the title of Baker Perkins Molins and Company, Brazil, S.A.

MR. J. D. ELSTONE, director of marketing of David Brown Tractors, Limited, has said that whereas the British tractor industry as a whole had increased its output by 13.7 per cent., David Brown production, which was a record in 1960, had risen by no less than 70 per cent.; 83.4 per cent. of all David Brown tractors built in the last 12 months had been exported to 84 countries. He gave a warning that British tractor manufacturers are likely to meet greater competition in export markets and particularly in Europe. The only way to retain the hold on this market was to maintain present price levels, or endeavour to reduce them, and to keep ahead in design and quality.

F. J. STOKES CORPORATION of Philadelphia, Pennsylvania, USA, has established a subsidiary company in Great Britain, registered as F. J. Stokes, Limited, with headquarters at 115, High Holborn, London, W.C.1, for the manufacture of machines and equipment for the plastics, chemical, pharmaceutical, automobile, electronics and food industries. Directors of the subsidiary are Mr. Allan A. Hutchings, vice-president in charge of sales; Mr. F. Joseph Stokes, jnr., vice-president in charge of manufacturing for the American company, and Mr. Malcolm Scott of London. General management will be under Mr. James T. Davies. British manufacture of Stokes equipment is already under way in association with Thomas White & Sons, Limited, of Paisley, Scotland.

Forthcoming Events

MARCH 13

Institute of Metals

Scottish local section: "Metallurgy and Musical Instruments," by W. H. Tait, 6.30 p.m., at the Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, C.2.

MARCH 14

Institute of British Foundrymen

Slough section: "Art Bronze Founding," by A. L. Parrott, 7.30 p.m., at the Lecture Theatre, High Duty Alloys, Limited, Buckingham Avenue, Slough.

Stoke-on-Trent section: "Some Casting Defects—their Cause and Cure," by J. L. Francis, 7.30 p.m., at the Stipendiary Court Room, Hanley Town Hall.

Coventry & district section: "Trends, Research, and Development in the Metallurgy of Cast Iron," by R. V. Riley, and "Costing in the Foundry Industry," by A. Kirkham, 7.30 p.m., in Room A5 of the Technical College, The Butts, Coventry.

MARCH 15

Liverpool Metallurgical Society

Visit to the Kirkby Works of Yorkshire Imperial Metals, Limited. (Details from secretary.)

North-East Metallurgical Society

"Properties of Metals at Very-low Temperatures," by C. J. Adkins, 7.30 p.m., at the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.

Institution of Production Engineers

Wolverhampton graduate section: Works visit to Austin Motor Car Company, Limited, Longbridge, Birmingham, 10.15 a.m.

MARCH 16

Institute of British Foundrymen

Beds & Herts section: "Experiences in making Moulds in a Mechanized Foundry," by H. Pinchin, 7.30 p.m., at K & L Steelfounders and Engineers, Limited, Letchworth.

MARCH 18

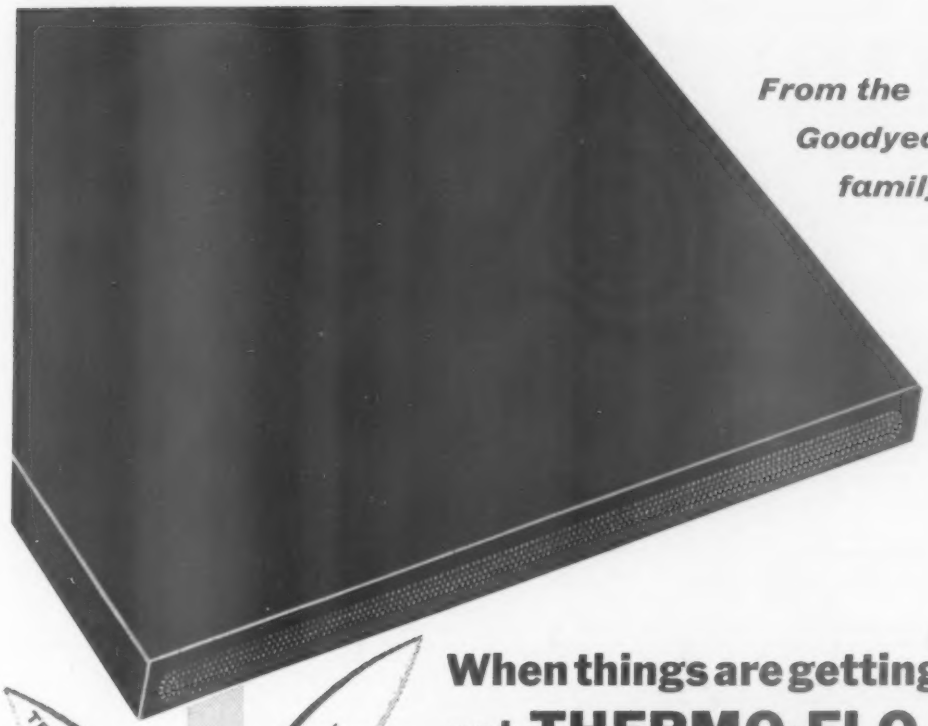
Institute of British Foundrymen

Stoke-on-Trent section: Works visit to Mirlees, Bickerton & Day, Limited, Stockport.

Bristol & West of England branch: Annual dinner/dance, 6.30 for 7 p.m., at the Royal Hotel, Bristol.

Institution of Production Engineers

Leeds graduate section: Works visit to Prince, Smith & Stells, Limited, Keighley, Yorks, 9.30 a.m.



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New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

833,500. Deutsche Gold-und Silber-Scheidenstalt Vormals Roessler, 9 Weissfrauenstrasse, Frankfurt (Main), Germany and F. S. Bayley, Clanahan & Company, Limited, St. James' House, Brazenose Street, Manchester, 2, Lancs.

Moulds and cores for use in precision casting by the "lost-wax" process. A readily disintegrable ceramic material is made for this purpose by the consolidation, by heating, of aluminium oxide to which may be added a minor amount of at least one other metal oxide of the II to IVth groups of the periodic-table, with a melting point higher than 1,500 deg. C.

833,925. Bocumer Verein fur Gussstahlfabrikation, A.G., Bochum, Germany.

Process for the vacuum treatment of a steel or steel-alloy. The metal is allowed to fall through a number of vacuum stages in which it is subjected to vacuums of different intensities. There is an upper stage in which the pressure lies between 10 and 500 mm. Hg. and a lower stage between 5 and 10^{-3} mm. Hg. The metal is subjected to the heating effect of an electric arc in the upper stage. It is conveyed from one stage to the next, in vacuo.

833,956. Geraetebau-Anstalt, Balzers, Liechtenstein.

A device for the pouring of molten metals at high temperatures from a crucible.

834,234. Patentverwertungsgesellschaft fur Eisen und Metalle m.b.H., Salzkotten, Westphalia, Germany.

A process for the production of high-quality castings from melts of ferrous and non-ferrous metals—in particular melts of aluminium or other light metals. The purpose of the invention is to bring about a further improvement in the quality of castings by the introduction of hydrogen, so as to avoid the formation of coarse pores in the castings, and the consequent reduction of strength and unsuitability for machine finishing.

834,603. Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7.

Production of ingots. In or on the mould there is provided a hot-top having a main passage (lined with exothermic material, from which the molten metal may be poured into the mould), and a secondary passage of small cross section opening to the mould but not lined with exothermic material.

834,627. Imperial Chemical Industries, Limited, Imperial Chemicals House, Millbank, London, S.W.1.

Special casting methods for high-melting-point metals such as titanium, zirconium, and their alloys.

834,723. Sparklets, Limited, Bridgwater House, Cleveland Row, St. James's, London, S.W.1.

Apparatus for the pressure-die-casting of metals, and moulding of other materials such as synthetic thermoplastic materials. The principal objective of the invention is to provide improved apparatus for feeding flowable material—such as molten metal—from a reservoir to a die in which the casting or moulding operation takes place.

834,864. Imperial Chemical Industries, Limited, Millbank, London, S.W.1.

Moulds for the casting of metals made from graphite powder. The powder, which is built up on a pattern, has incorporated in it a thermosetting synthetic resin (such as phenol-formaldehyde) which is then cured and thereafter substantially carbonized.

834,876. Mo Och Domsjo A.B., Ornskoldsvik, Sweden.

Method of making sand cores or moulds for metal casting, which is claimed to be an improvement on the CO_2 Process. The technique is similar but moulds and cores which disintegrate more readily after casting are produced. An alkaline earth metal oxide or hydroxide in amount 1 to 10 per cent. is added to sand and water. The addition of an organic binder in the form of a water-soluble cellulose derivative is also claimed.

834,909. Demag A.G., Wolfgang-Reuter-Platz, Duisburg, Germany.

A method for the production of ingot steel and iron castings which are substantially non-porous, free of shrink holes, and resistant to ageing. A mould for carrying out the method is also patented.

835,021. Deutsche Erdol-A.G., Mittleweg No. 180, Hamburg, 13, Germany.

Method and apparatus for the casting of metal cylinders around cores.

835,084. Babcock-Wilcox Company, 161 East 42nd Street, New York, 17, N.Y., USA.

The addition of a natural cryolite or an analogue thereof (in the proportion of 1 part of 25,000 to 40,000 parts by weight to molten metal) to the cavity of a continuous-casting mould. This material is claimed to not only prevent the formation of metal oxides, but also provides a suitable coating on the surface of the mould which has a non-wetting characteristic with respect to the metal being cast. Also, the material is stated to be effective in fluidizing slag which may be present, which then forms a film on the exterior surface of the cast metal, and thus does not interfere with the heat-transfer effects of the casting mould.

835,159. British Oxygen Company, Limited, Bridgwater House, Cleveland Row, St. James's, London, S.W.1.

Treatment of molten ferrous material, for example, for the removal of impurities, such as carbon, silicon, manganese, phosphorus and sulphur. The molten metal is poured and allowed to fall through a reaction space in contact with a stream of an oxidizing gas flowing in the same direction. This gas may consist of air, oxygen-enriched air, oxygen, carbon-dioxide or oxygen diluted with an inert gas.

835,249. Magnesium Elektron, Limited, Lumm's Lane, Clifton Junction, near Manchester.

Means for filtering molten light-metals, such as magnesium and aluminium and their alloys for the removal of insoluble matter.

835,535. E. R. Nilsson, 24 Orgrytevagen, Goteborg, S. Sweden.

Improvements in the manufacture of pipes for heat exchangers. The material forming the ribs in a pipe which has an inner steel-tube core, is cast around a steel tube filled with a heat-resistant material. The tube is given a clean surface, possibly by sandblasting before the casting operation.

AN OFFICE has been opened by Ambuco, Limited, at 158, Bath Street, Glasgow, C.2, and Dron & Dickinson, Limited (of the same address), have been appointed to act as their representatives in Scotland.

Baker Perkins Machinery at work . . . . . *at Peter Brotherhood Ltd.*

Peter Brotherhood Ltd. use this 'Cadet' Rotary Table Shot Blast Machine for a wide range of application at a high production rate. Note especially the control desk which includes signal lights, 24 volt current socket for inspection and ammeters indicating the shot output of the impeller. The wiring circuit is arranged for automatic operation to cut out human errors.

Baker Perkins Ltd.

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HISTORICAL NOTE

Peter Brotherhood Ltd. were established in London in 1868. In 1907, the works was transferred to Peterborough, Northants. In their Foundry, they produce a wide range of general engineering castings for air and gas compressors, steam turbines, steam engines, refrigeration plant, water turbines, chemical filtration plants, textile machinery, brewery machinery, and many other applications

Raw Material Markets

Iron and Steel

The ironfoundries are well provided with supplies of all grades of pig-iron and from overall outputs no difficulty is experienced in obtaining the required tonnages. For the production of high quality castings, which are comparatively in greatest demand, the low phosphorus irons continue to be taken up in substantial quantities. Apart from one or two brands which are still short in supply on account of limited production, consumers are able to obtain all the supplies required. The shortage in some brands can be made up in alternative irons from the several furnaces now producing this iron. Appreciable tonnages of hematite are also being consumed by the foundries as well as some refined iron, and both grades are in good supply.

Outputs of the high phosphorus irons are more than adequate to satisfy the current requirements of the light, jobbing, textile, and some of the engineering foundries which use this grade. Producing furnaces are able to dispose of substantial tonnages, but overall outputs are not fully absorbed by home users, and consignments continue to be shipped to overseas buyers.

The engineering foundries connected with the motor car industry are sharing in the improvement in this trade, and although the total demand for castings is well below the tonnages previously taken, current delivery schedules have enabled some of them to revert to a normal five-day working week. In the tractor and commercial vehicle section of the motor industry the usage of castings is maintained at high levels.

The engineering and speciality foundries supplying high duty castings to many other trades are receiving good support and continue to obtain substantial outputs. The light foundries supplying castings to the building trades are fairly well occupied, but much more work is needed by the foundries catering for the domestic utensil trade. The jobbing foundries have a fair amount of work on hand but, together with the textile foundries, could undertake a much larger flow of orders. Many foundries are short of scrap, particularly those in the Midlands where arisings of suitable cast iron and steel qualities are insufficient to meet all demands fully. The heavier and better grades of cast iron scrap are very scarce. Coke deliveries are satisfactory and ganister, limestone, and firebricks are available to requirements.

Most of the re-rollers are able to obtain appreciable outputs of their products, although at some establishments production is on a reduced scale. This is due mainly to the lessened demand from the motor industry. The orders previously booked by the re-rollers for small bars and light sections have enabled them to maintain their present production levels. The call for reinforcing rods and bars is maintained at high levels.

Mild steel semis are in good supply. The re-rollers are well provided with billets, blooms, and slabs in this grade of steel, and home steelworks could supply larger quantities than those now called for. Carbon and alloy steels are not so plentiful. All arisings at the steelworks of suitable re-rolling defectives and crops are readily taken up.

Non-ferrous Metals

Copper in London is having a difficult time in holding any price level, although its downward trend is more gradual than expected, the bullish influences that the troubles in Northern Rhodesia and the Congo were exerting on the market having largely disappeared. When external influences cease to have a dominant position the underlying position of the metal begins to make itself felt and, with copper, this is more bearish than bullish as it is impossible to hide the fact that there are ample stocks of the metal on both sides of the Atlantic.

There is a quiet strength about the undertone to the market and consumer interest tends to increase as the quotation falls—a healthy sign and one which is attributed to the optimistic long term appraisal of what the Kennedy administration will do in the United States. Nevertheless, in the short run, this has not prevented the intake price for scrap being lowered by ¼ cent a pound in the United States nor has it led as yet to any appreciable increase in demand. The price of 29 cents a pound is applicable to both producers and custom smelters.

Tin is a quiet market in London and in New York but fluctuating between being good and bad in Singapore. The overall outlook for the white metal is still considered good. In London the feature of the market has been demand for three months metal which has resulted in a contango being established of around £3 a ton. Continental interest is improving. In the US the price is fluctuating narrowly around $1.02 a pound.

The chief item of news is that Nigeria will commission a new tin smelter this year which will be opened by Consolidated Tin Smelters and it will be capable of handling the whole country's output. This was something less than 10,000 tons in 1957, the year before tin restrictions came into force.

Lead is quiet in London and steady in the US where the quotation is still recorded at 11 cents a pound. The one item of news that upset the market was from Australia where the Broken Hill company stated that it was maintaining its present rate of output. However, this was interpreted in London as being made to allay fears of the labour unions.

Zinc is weak on both sides of the Atlantic. In London it has been moving in sympathy with copper and has not shown much life of its own. In the US the slight improvement in the output of steel has helped and the price is unchanged at 11½ cents a pound.

Science and Technology Library

Transport of the National Lending Library for Science and Technology from London to its permanent home at Boston Spa in Yorkshire began on February 28 when the first of many railway containers full of literature left London. The collection of scientific literature, which was started by the Department of Scientific and Industrial Research four years ago, has been housed at Regent's Park. It is the foundation of a national collection which will eventually run to millions of volumes: more than 200,000 volumes will be moved from London to Boston Spa.

The library, which provides a loan and photocopying service for scientific literature for industrial firms, research organizations, universities, technical colleges and Government departments, is expected to be fully operational by the autumn of 1962. It is one of two recommended by the Advisory Council for Scientific Policy; the second library to be known as the National Reference Library for Science and Invention will be formed from the Patents Office Library. Dr. Donald John Urquhart, who joined DSIR in 1948 from the Science Museum Library, has been responsible for planning the library since 1956.

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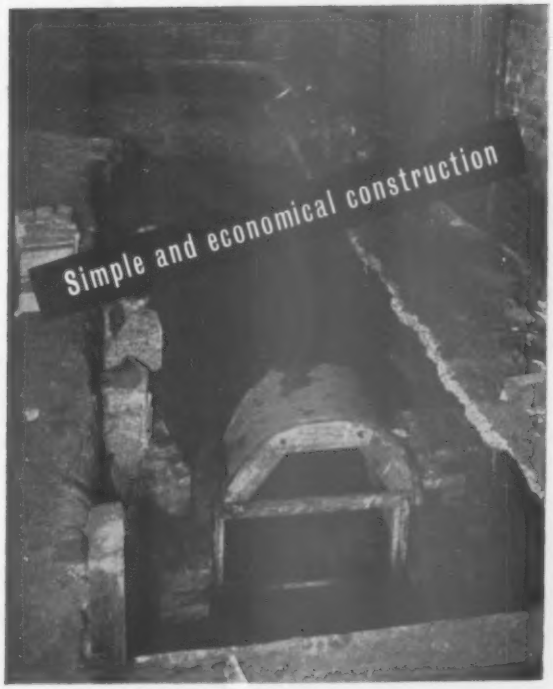

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AP75

Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated)

March 8, 1961

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over:, Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P 10-ton lots or over, £23 5s. 0d., delivered Birmingham £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over; N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-Iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(per ton unless otherwise stated, delivered)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si, £43 10s. 0d. to £46 0s. 0d., scale 15s. 0d. per unit, lumpy. 75 per cent. Si, £60 0s. 0d. to £63 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 10s. 3d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 13s. 3d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £81 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £61 10s. 0d

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons & over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C, £40 11s. 0d.; silico-manganese, £43 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

*Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £66 7s. 0d.; nickel-chrome, £97 1s. 0d.; nickel-chrome-molybdenum, £109 14s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £226 5s. 0d. to £226 10s. 0d.; three months, £227 5s. 0d. to £227 10s. 0d.; settlement, £226 10s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 2½d. per lb.; rods, 244s. 0d. per cwt. basis; 20 s.w.g., 279s. 0d. per cwt.

Tin.—Cash, £806 10s. 0d. to £807 0s. 0d.; three months, £810 0s. 0d. to £811 0s. 0d.; settlement, £807 0s. 0d.

Lead (Refined Pig).—First half March, £65 17s. 6d. to £66 17s. 6d.; first half June, £66 17s. 6d. to £67 0s. 0d.; settlement, £66 0s. 0d.

Zinc.—First half March, £85 0s. 0d. to £85 5s. 0d.; first half June, £83 12s. 6d. to £83 15s. 0d.; settlement £85 5s. 0d.

Zinc Sheets, etc.—Sheets, 15g., and thicker, all English destinations, £122 5s. 0d.; rolled zinc (boiler plates), all English destinations, £120 10s. 0d.; zinc oxide (Red Seal) d/d buyers' premises, £97 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10d. per lb.; sheets to 10 w.g., 200s. 3d. per cwt.; wire, 2s. 8½d.; rolled metal, 200s. 3d. per cwt.

Brass (Brazing).—BS1400, B3, £176; B6, £225.

Brass (High Tensile).—BS1400, HTB1, £196; HTB2 £213; HTB3, £231.

Gunmetal.—BS1400, LG2, £220; LG3, £230; G1, ½% £294; G1, 1%, £284.

Phosphor Bronze.—BS1400, PB1 (AID released), £310; BS1400, 90/10/1, £298.

Leaded Phosphor Bronze.—BS1400, LPB1, £242.

Phosphor Bronze Strip, etc.—Strip, 287s. 3d. per cwt.; wire, 4s. 1½d. per lb.; rods, 3s. 3½d.; tubes, 3s. 4d.; chill cast bars, solids 3s. 3½d.; cored 3s. 4½d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £69 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £245; AB2, £253.

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SIZES: 50lb., 100lb., 200lb., 300lb. & 1000lb. capacity. Other sizes gladly built to order.

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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

AM 42, married, have A.I.M., Management Diploma. Executive U.S. machine tool and British light castings foundries. Have foundry design and layout, research and development experience. Seek permanent position in modern foundry or with foundry management consultants. Will travel. Box AM629, FOUNDRY TRADE JOURNAL.

FOUNDRY EXECUTIVE, 35, B.Sc., experience of ferrous and non-ferrous trade, desires post with prospects. Production or representation considered. Foundry equipment, foundry suppliers, consultancy, etc. All enquiries answered. Box FE616, FOUNDRY TRADE JOURNAL.

PROGRESS MANAGER, 33, seeks new position. Fully experienced all foundry planning and production control methods. Box PM631, FOUNDRY TRADE JOURNAL.

WEST MIDLANDS. Expert FOUNDRY SALES REPRESENTATIVE (54), M.I.B.F., available, change reputable firm, life experience trade. Ferrous, non-ferrous, mechanised, 1 oz. to 10 tons. Car. Box WM630, FOUNDRY TRADE JOURNAL.

METALLURGIST (L.I.M.), aged 26, desires position with a progressive company. Experience of the cupola melting of grey irons and whiteheart malleable. Some experience of S.G. iron. Metallurgical analysis, metallography and mechanical testing. Accustomed to control of laboratory. Anything considered. North of England preferred. Box ML628, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

FOUNDRY PRODUCTION MANAGER required by expanding Ferrous and Non-ferrous Foundry on the South Coast, to act as intermediary between Works Manager and Foundry Foreman. Duties will include Production Planning and metallurgical control. Must have practical and technical experience. Permanent, pensionable post with good prospects for advancement. Box FP625, FOUNDRY TRADE JOURNAL.

Patternmakers, Machine and Floor Moulders, Coremakers

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THESE will be permanent positions, providing excellent salaries and conditions in an old well established Foundry producing Spheroidal Graphite and Alloyed Irons.

Reply in first instance to:

Foundry Manager,
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Christchurch, New Zealand.

SITUATIONS VACANT—*contd.*

FOUNDRY FOREMAN required. Must be experienced in batch production of small castings by mechanised moulding and coremaking methods, and accustomed to handling labour. Location, Hertfordshire. Write stating age and salary requirements. Box FF626, FOUNDRY TRADE JOURNAL.

Advertisers whose announcements appear under a box number are urged to acknowledge, however briefly and informally, all replies received. This particularly applies to advertisements under "Situations Vacant"; serious inconvenience and, sometimes, real hardship can be caused to applicants who receive no indication even of the safe receipt of their communication. Failure to acknowledge replies can also reflect on the good faith of this journal, which is responsible for their onward transmission. If it is desired to maintain anonymity, an acknowledgement on plain paper, quoting the relevant box number, is all that is necessary.

PATTERNMAKERS (wood or metal) required. Rate 7s. 8d. per hour, plus quarterly output bonus for right men. STANDARD PATTERN CO., LTD., 25a, Broadwall, Stamford Street, S.E.1. WAT. 6875.

CORE DEPT. SUPERINTENDENT required to take full charge of a Core Shop making Machine Blown, Bench and Shell Cores for a foundry producing 500 tons of Automobile and similar Grey Iron Castings per week. Applicants must have of necessity, drive and ability and be capable of controlling a department employing 200 people, both male and female. Basic salary in the region of £1,150 per annum and bonus based on results. Box CD623, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FOREMAN required for modern Iron and Steel Foundry in Midlands area. Good knowledge of mechanised production most essential. Reply stating age, previous experience and salary required. Box FR637, FOUNDRY TRADE JOURNAL.

AN old-established company of Foundry Plant and Shot Blast equipment manufacturers invites applications from young FOUNDRY TECHNICIANS who are interested in entering the selling side of the industry. Full training would be given and car provided. Apply in confidence, giving details of education, experience and salary required. Box AO639, FOUNDRY TRADE JOURNAL.

ROUTINE ANALYST, age 40/45 years, required in the Bolton Area, for the analysis of cast iron, steel and non-ferrous metals. Knowledge of foundry materials preferred. Capable of working without supervision. Good salary, pension scheme, canteen. Box RA632, FOUNDRY TRADE JOURNAL.

JUNIOR METALLURGISTS required for training in Metallurgical, Laboratory and Foundry Control of Chilled Iron Roll production. Apply to MILLER & COMPANY, LIMITED, London Road Foundry, Edinburgh, 7, stating details of age, education, qualifications and experience.

FOUNDRY PROGRESS MANAGER required by old-established company in North Midlands producing cast iron pipes and special castings principally for gas and water undertakings, power stations, etc.; a first-class man, well experienced in the trade is required, competent to organise and control the dept. efficiently; a commencing salary of up to £1,000 p.a. is offered, there is a contributory pension scheme and the position is permanent and progressive. Applications giving full personal and business particulars (in the strictest confidence) to Box FP635, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT

A Foundry Superintendent, experienced in mass production of small iron castings, preferably (but not essential) with metallurgical training, is required for a new modern Foundry in the N.E. Coast area. Top salary will be paid to the right man and the position will, of course, be pensionable.

Applications, giving full details of past experience, should be submitted to Box F.S. 638

FOUNDRY TRADE JOURNAL

SITUATIONS VACANT—contd.

WORKS MANAGER for a rapidly expanding Aluminium Foundry producing high quality sand and gravity die-castings. Excellent opportunity for a qualified foundryman to join a progressive company. All replies for atttention of Man. Director will be treated in strict confidence. Apply COPAL FOUNDRIES LTD., Golds Green Works, West Bromwich.

SENIOR METALLURGIST (Qualified) required for a foundry producing high quality ferrous and non-ferrous castings by investment, shell and high quality sand methods. Experience of shell casting and HF melting preferred but not essential. Contributory Pension Scheme. Details of qualifications, training, experience, age and salary, etc., to Box SM636, FOUNDRY TRADE JOURNAL.

AUSTRALIAN OPPORTUNITY. A major concern in Australia requires DIEMAKERS with recent experience in hollow and solid aluminium die manufacture and capable of correcting dies at the press. Basic wage £23 (Australian) plus overtime and generous yearly bonus. Free transport for applicants and families and free initial accommodation offered. Write in confidence giving age and experience to WILLIAM COWARD & CO. LTD., 3 St. James's Square, London, S.W.1.

OPPORTUNITY for keen ENGINEER to assist in the planning and installation of a new mechanised Foundry. Excellent prospects. Apply giving details of age, experience, qualifications and salary required to Box OF619, FOUNDRY TRADE JOURNAL.

CAST IRON PIPES AND CONNECTIONS

FOUNDRY SUPERINTENDENT wanted for FOUNDRY in the Glasgow area. Applicants should have good knowledge of work in Greensand and CO_2 and be able to control labour. Salary in accordance to experience and qualifications, but will be a first class position to the successful candidate. Write in first place to Box No. 2320, WM. PORTEOUS & Co., Glasgow.

ASSISTANT TO FOUNDRY MANAGER REQUIRED

Applications are invited from men between the ages of 30 and 45 for the position of Assistant to the Foundry Manager in a modern mechanised grey iron foundry in the West Riding. The foundry produces up to 120 tons of machinery castings per week, ranging in weight from a few ounces to 4 cwt. These are produced on a fully mechanized plant with ancillary floor and bench moulding sections.

Candidates must possess a thorough practical and technical knowledge and have experience in all phases of modern grey iron foundry practice. He must have drive, initiative, organizing and executive ability and be able to control labour.

The post, which carries full staff status with contributory pension scheme, is progressive and offers scope for promotion. Assistance with housing is possible for the successful candidate.

Applicants should state age and give in chronological order full details of training, experience and positions held, with an indication of salary level.

All applicants will be treated in strict confidence and acknowledged.

Write:

BOX AA614
Foundry Trade Journal

SITUATIONS VACANT—contd.

METALLURGIST — ASSISTANT required by Company operating modern mechanised Foundries producing Grey, High Duty and Malleable iron castings. Experience in Cupola operation in one of these fields is desirable since successful applicant will be required to take control of a melting unit. Excellent opportunity for Metallurgist in the age range 23-30 to join expanding organisation. Modern housing accommodation can be arranged if required. Please apply, giving age, details of experience and salary required to PERSONNEL OFFICER, Guest, Keen & Nettlefolds (Cwmbran), Ltd., Clomendy Road, Cwmbran, Mon.

NATIONAL FOUNDRY COLLEGE
Stafford Street, Wolverhampton

THE Governors of the College invite applications for the post of

SENIOR LECTURER

A University Degree (preferably in Engineering) or its equivalent, together with qualifications in Management are essential. Candidates should have had a sound training in the Foundry Industry, and experience in Foundry Management would be a distinct advantage.

The salary will be in accordance with the Burnham Scale (£1,550—£1,750).

Full particulars may be obtained from:

The Clerk to the Governors, National Foundry College, Education Offices, North Street, Wolverhampton.

FOUNDRY METALLURGIST required for an Iron Foundry in the West of Scotland, specialising in ingot moulds and alloy castings, including S.G. The candidate must be capable of taking full responsibility for technical control of founding, testing, etc. Salary in accordance with qualifications and experience, but not less than £1,250 per annum. Assistance with housing will be considered. Reply to THE SECRETARY, Fullwood Foundry Company, Limited, Mossend, Bellshill, Lanarkshire.

TECHNICAL SALES REPRESENTATIVE required for London and S.E. Counties by Foundry and General Engineering Company. Established connections and ability to promote new contacts necessary. Write in confidence giving fullest details of experience, age and salary required, to SALES MANAGER, East Sussex Engineering Co., Ltd., Phoenix Iron Works, Lewes, Sussex.

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Surplus Foundry Plant and Forging Equipment

Best prices given

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WANTED. Shot Blasting Machine, table type, 90 in. Information required: make, age, condition and whree machine can be seen working. Box SB633, FOUNDRY TRADE JOURNAL.

WANTED—Electric Stoving Oven, 400 volts standard A.C. supply, 20-40 kW, with forced air circulation. Maximum operating temperature 400 deg. C. WHITEFIELD MACHINERY & PLANT LIMITED, 48, Chatham Street, Stockport, Cheshire.

WANTED.—MAGNET for lifting scrap, 45 in./54 in. diameter, 220 volts D.C., and Suspension Magnet, 45 in./54 in. diameter, 110 volts, D.C., for collecting tramp iron. Offers to: GEO. H. CAMPBELL & Co., Atlas Works, Carlisle Road, Airdrie. 'Phone Airdrie 2277.

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SECONDHAND (appears unused) "SAGAR" 8½ in. centres Wood Turning Lathe, pattern maker's type with travelling saddle, 4 speeds, motorised 3 phase, and with extra equipment.

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Notice is therefore given that we shall be obliged to dispose of all advertisement blocks that have not appeared in the journal since **December, 1957,** if no application has been received for their return on or before **March 22, 1961.**

Foundry Trade Journal,
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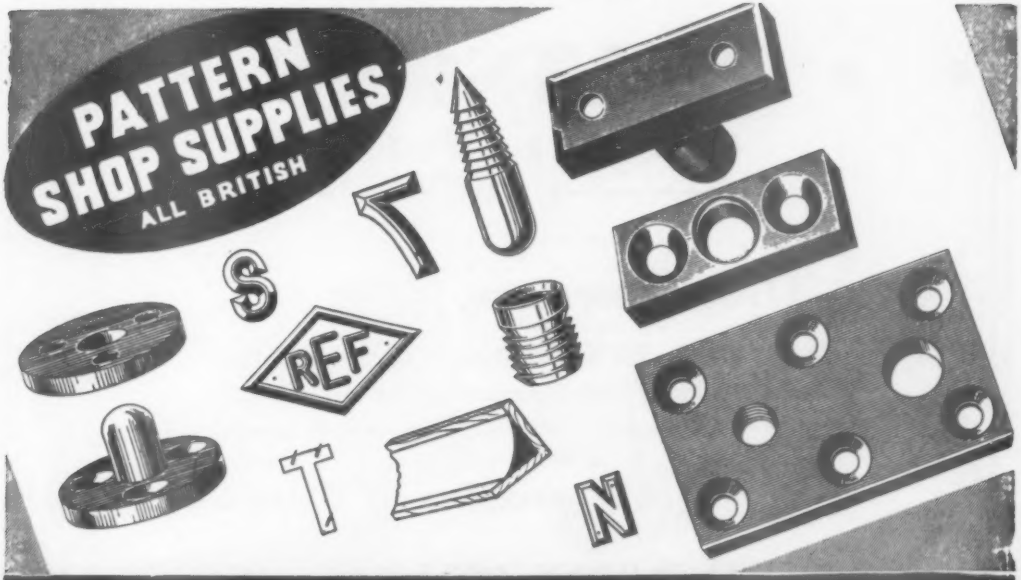

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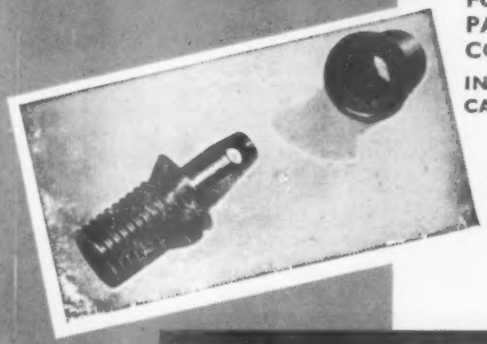

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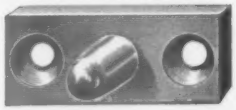

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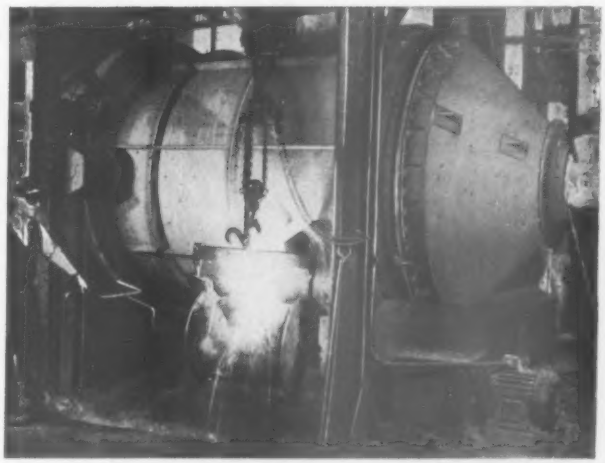

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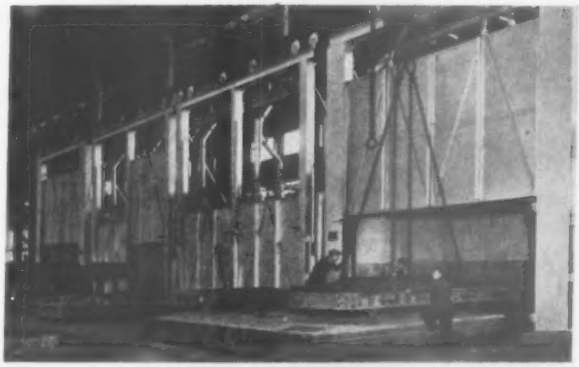

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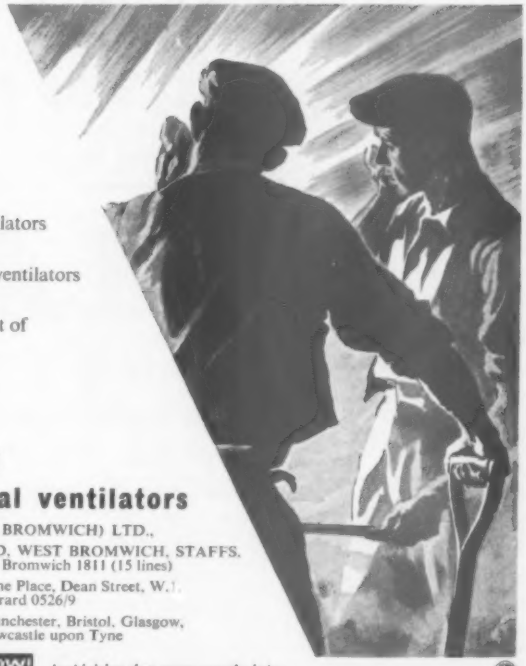

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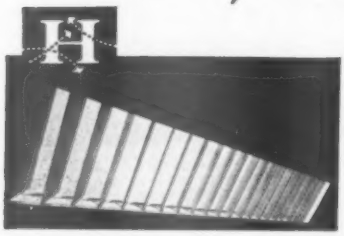

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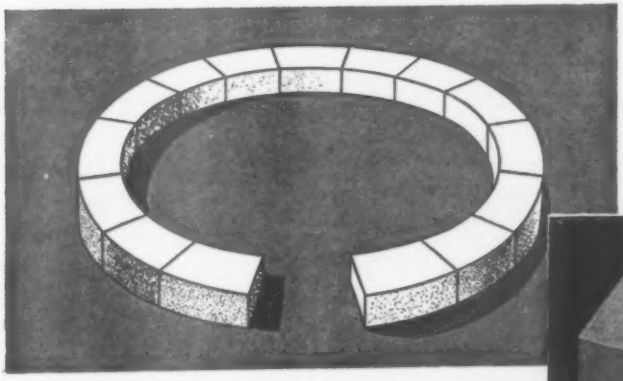

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